COUNTY OF SANTA BARBARA
CALIFORNIA

Conservation Element

Santa Barbara County Comprehensive Plan

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General Plan Advisory Committees

Carpinteria and Summerland

Montecito

Santa Barbara Area

Goleta Valley

Santa Ynez Valley

Lompoc

Fifth District

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Introduction

STUDY PURPOSE AND ORGANIZATION

Santa Barbara County's natural and cultural resources are the subject of the Conservation Element. This element is required by State Planning Law as part of the Comprehensive Plan,"for the conservation, development, and utilization of natural resources including water and its hydraulic force, forests, soils, and rivers and other waters, harbors, fisheries, wildlife, minerals, and other natural resources" (Government Code, Section 65302 (d)).

There are six technical studies presented in this report: Water Resources, Ecological Systems, Mineral Resources, Agricultural Resources, Historic Sites, and Archaeological Sites. These studies, along with the geologic, fire and flood studies of the Seismic Safety and Safety Element, are used in the preparation of the Open Space Element, the Land Use Element, and the Circulation Element. In the Open Space Element and the Land Use Element, factors identified as constraints on agriculture, recreational opportunities and urban development are used to help delineate open space and urban land uses.

Several subjects that could have been discussed in the Conservation Element are covered in other studies and Comprehensive Plan elements. Erosion, shoreline regression, fire hazards and flood control are included in the Seismic Safety and Safety Element because they relate to geologic problems and public safety. Air pollution and its impact on air resources in Santa Barbara County, and clean air attainment are subjects of studies being prepared by the County under provisions of the federal Clean Air Act. It is anticipated that the Air Quality Maintenance Plan (AQMP) and the Air Attainment Program (AAP) will be used as the basis for an Air Quality Element. While an Air Quality Element is not a mandatory part of the Comprehensive Plan, State Planning Law (Government Code, Section 65303 (k)) provides that additional elements may be prepared on subjects which concern the physical development of the County. The air quality implementation strategies developed for the AQMP and AAP will be related to the Land Use and Circulation Elements, and will be incorporated where necessary into the Comprehensive Plan Implementation Program.

Onshore oil and gas development is discussed in the Mineral Resources chapter of the Conservation Element, while offshore production is studied by the state Office of Planning and Research in its report, Offshore Oil and Gas Development: Southern California*. A primary

*OCS Project Task Force, Office of Planning and Research, October 1977.

finding of the state report is that California has little control over outer continental shelf (OCS) development. Although OCS development plans may include onshore facilities, such facilities can be built offshore in federal waters. As the report further notes, "The course of offshore development will determine the onshore impacts California must bear, but the state and local governments of California can only comment on leasing and development plans and hope their concerns will be reflected in the decisions of federal officials. California may gain some control over OCS oil and gas development through the consistency provisions of the Coastal Zone Management Act as amended, but the effectiveness and scope of these provisions is uncertain" (p. 17). As a solution to this problem, the state report recommends that Congress pass legislation requiring the Secretary of the Interior to accept the recommendations of an affected state's governor on proposed OCS action, unless the Secretary determines they are not consistent with national security or the overriding national interest. It is not clear how this recommendation would answer the concerns of an affected local government.

Other energy-related studies include the following: The Local Coastal Program is evaluating locations for potential energy facilities; the Pipeline Feasibility Study is investigating the possibility of transporting oil by pipeline, thus eliminating the need for more onshore processing plants and marine terminals; the Liquefied Natural Gas (LNG) Siting Task Force is analyzing the impacts of the proposed LNG port and regassification facility near Point Conception. As information becomes available from these studies, it will be related to the Comprehensive Plan. A chapter on conservation and energy is included in this report.

PREPARATION OF THE CONSERVATION ELEMENT

An interdiciplinary team worked closely together on the technical studies included in this report. In most instances, existing source material was utilized, but some previously unavailable material, principally new maps, also was incorporated into the Conservation Element. Up-to-date agricultural land use maps were provided by the County Farm Advisor and his staff and the University of California, Santa Barbara, Geography Department's Remote Sensing Unit. The U.S. Soil Conservation Service supplied field maps from the most recent soil survey of the South Coast area. Over 100 historic sites were mapped for the first time by the Santa Barbara Historical Society. Other material not previously published will be cited in the individual chapters in which it is discussed.

Certain chapters of the Conservation Element were written by the individuals responsible for the technical studies, while other

chapters are based on analyses of data from a variety of sources, and were written by Livingston and Associates. Throughout the study, the County and the cities, and many state and federal agencies provided valuable assistance. The responsibility for each of the chapters is listed below.

Water Resources	County Planning Department, from County Water Agency reports; Bookman-Edmonston, Inc.
Ecological Systems	Dr. Joseph Connell, Robert Engel, Dr. J. R. Haller, Dr. Richard Howmiller, and Dr. William Murdock, environmental biologists at the University of California, Santa Barbara
Mineral Resources	Livingston and Associates
Agricultural Resources	Livingston and Associates
Historical Sites	Livingston and Associates
Archaeological Resources	Peggy Ehmann, Stephen Horne, Mike Perez, and Jeff Quilter, archaeologists at the Department of Anthropology, University California, Santa Barbara, under the direction of Dr. Michael Glassow
Conservation and Energy	County Planning Department

LAND USE AND ENVIRONMENTAL DATA SYSTEM

The land use and environmental data system designed for the Comprehensive Plan combines several methods for data collection, storage, retrieval, and analysis. First, all land use and environmental information was mapped on County-wide and study area reproducible base maps. In the interests of efficiency and accuracy, certain data then were coded and stored in a computer. The computer-based data system permits large amounts of data to be handled more effectively and efficiently than using other information systems, and provides a degree of precision appropriate for land use planning. However, certain rural areas of the County do not require refined computer analysis because manual techniques utilizing overlays and other methods of interpreting environmental information are just as effective. For this reason, a data system that would permit progressively refined studies of land use and natural resources was designed.

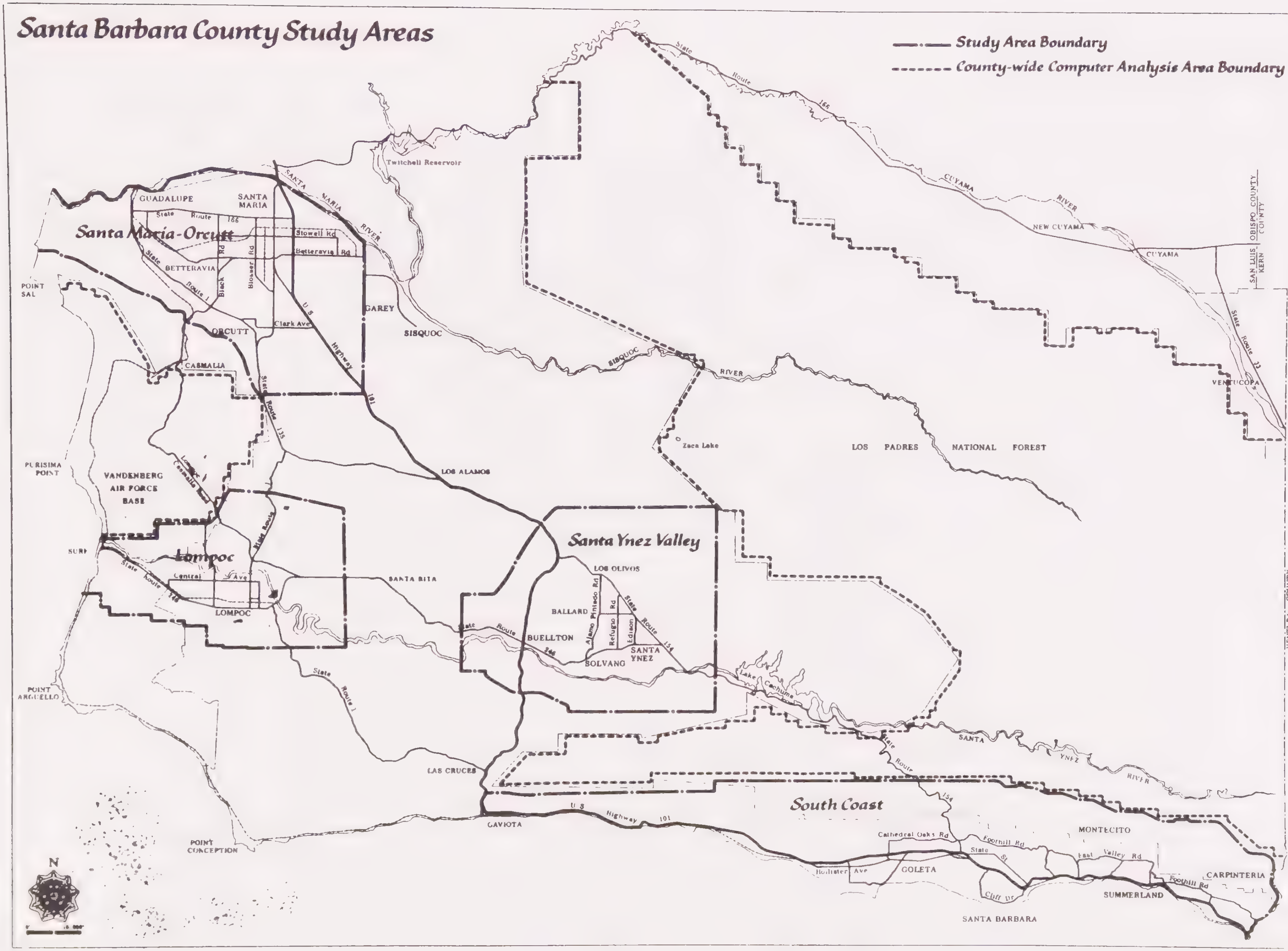
Study Areas

To resolve the problems of data collection and analysis presented by the size and diversity of land use and environmental data in the County, three types of study areas were defined. In large areas of the County under federal ownership and on the Channel Islands, less precise information is needed for comprehensive planning (except for recreation potential) than in other portions of the County. So, Los Padres National Forest, Vandenberg Air Force Base, and the four Channel Islands were excluded from the computerized data base. However, information on agriculture, ecological systems, mineral resources, and water resources was analyzed for these areas and, in almost all cases, is shown on manually prepared maps published in this report.

In the remaining portion of the County, two scales of analysis were employed. County-wide, the objective was to analyze regional resources and environmental constraints in order to be able to identify and rank opportunities for urban development, agricultural expansion, and recreational activities. Areas to be preserved because of environmental hazards, ecological communities, or scenic value also were evaluated. The boundaries of the County-wide study area for computer analysis are indicated on the Santa Barbara County Study Areas map. All County-wide data are mapped at a scale of 1 inch equals 8,000 feet, although published maps, of course, have been reduced in scale. Wherever urban development pressure is likely to be significant between now and 1990, a more refined level of analysis was undertaken. Four study areas, the South Coast, Santa Ynez Valley, Lompoc, and Santa Maria-Orcutt, were selected to encompass the lands where urbanization is likely to occur and where detailed analyses of agriculture, open space, scenic value, and recreational opportunities would be in order. Together, these areas include 589 square miles, 40 per cent of the County-wide study area. The boundaries of the study areas are indicated on the Study Areas map.

Other areas in the County also may have limited urban development potential, and these lands have been analyzed at the County-wide scale. However, it is unlikely that these areas will be developed extensively at urban densities by 1990. Certain outlying areas of the County with possible development potential, such as the Los Alamos area and the Cuyama Valley, will be examined carefully to determine not only their suitability for urban development but also the adverse impacts that development might create.

Not all of the land within the study areas actually has urban development potential. Two of the most obvious reasons are steep slopes and large public ownerships. To make the computer analysis more efficient and to keep the cost of the data bank at a reasonable level, the boundaries of



Santa Barbara County Study Areas
Study Area Boundary
County-wide Computer Analysis Area Boundary
Santa Maria-Orcutt
Santa Ynez Valley
Lompoc
South Coast
GUADALUPE
SANTA MARIA
BETTERAVIA
ORCUTT
CASMALIA
GAREY
SISQUOC
Twitchell Reservoir
SANTA MARIA RIVER
SISQUOC RIVER
CUYAMA RIVER
NEW CUYAMA
CUYAMA
VENTUCOPA
SAN LUIS OBISPO COUNTY
KERN COUNTY
VENTURA COUNTY
Zaca Lake
LOS PADRES NATIONAL FOREST
LOS ALAMOS
POINT SAL
PURISIMA POINT
VANDENBERG AIR FORCE BASE
SURF
LOMPOC
SANTA RITA
LOS OLIVOS
BALLARD
BUELLTON
SOLVANG
SANTA YNEZ
Lake Cachuma
SANTA YNEZ RIVER
POINT ARGUELLO
LAS CRUCES
POINT CONCEPTION
GAVIOTA
U S Highway 101
GOLETA
SANTA BARBARA
MONTECITO
SUMMERLAND
CARPINTERIA
N

areas for computer analysis were set to include a total of only 311 square miles of land with possible urban development potential. Four criteria were used to determine which areas to eliminate from detailed computerized data mapping and analysis.

- Areas with over 30 per cent average slope, which are too steep to be developable.
- Vandenberg Air Force Base.
- Los Padres National Forest.
- Areas exhibiting special environmental characteristics making them extremely difficult or infeasible to develop.

Because data were mapped at a scale of 1 inch equals 2,000 feet for the entire study area, and not just for the computer analysis area, data are available for the areas that were excluded, and therefore can be utilized as needed. Application of the criteria to delimit the computer analysis areas is described below in order to clarify how the boundaries were set.

South Coast--A large portion of the South Coast lies within the boundaries of the National Forest, and this line generally was used as the boundary for the computer analysis area from the Ventura County line to a point 2.4 miles west of Las Varas Canyon. However, portions of Toro Canyon and other areas within the National Forest with slopes averaging less than 30 per cent also were included in the computer analysis area.

Santa Ynez Valley--The most significant criterion applied to this study area was the exclusion of all lands averaging over 30 per cent slope. In addition, the Foxen Canyon area was omitted because half the Canyon lies outside the study area boundary. An area east of Los Olivos proposed for subdivision was included at the request of the County staff.

Lompoc--A large segment of the western portion of the Lompoc area within Vandenberg Air Force Base was excluded from the computer analysis area. In addition, the Federal Correctional Institution adjacent to the Air Force Base was omitted. Other portions of the Lompoc study area were eliminated because of excessive slope or, in the case of the southeastern section, because it lies within the flood plain of the Santa Ynez River.

Santa Maria-Orcutt--Here, the computer analysis area is almost as large as the study area because few lands were omitted. Areas of coastal and inland sand dunes were assumed unsuitable for urban development along with an oil field area south of Orcutt. Other portions of the study area averaging over 30 per cent slope or lying between the Southern Pacific Railroad tracks and steep lands were excluded.

Table 1 provides a summary of the acreage in the study areas and in the computer analysis areas.

TABLE 1. SANTA BARBARA COUNTY STUDY AREAS (Acres)

	Study Area	Area for Computer Analysis
South Coast	123,400	58,500
Santa Ynez Valley	94,000	44,500
Lompoc	64,300	27,800
Santa Maria-Orcutt	95,700	68,500
Total	377,400	199,300

Computer Mapping

Computer mapping techniques provide many benefits in a comprehensive planning study. Most important is the ability of the computer to analyze large amounts of data quickly and to produce maps at desired scales using legible graphic symbols. Using computer processing, it also is quite easy to test the efficacy of alternate solutions to a given problem and to compare the results graphically. The uniformity of scale and consistency of graphics format simplify analysis and interpretation of computer maps.

The key to a computer data system is a procedure permitting the computer to identify the spatial location of environmental data. The most practical approach is to employ an x-y grid coordinate system for reference purposes. Every location on a map then has a specific set of identifying coordinates, and information obtained from one map can be compared easily with information found on another map. These coordinates, in turn, are referenced to California State Plane Coordinates, so that the data system prepared in this study is compatible with other data systems.

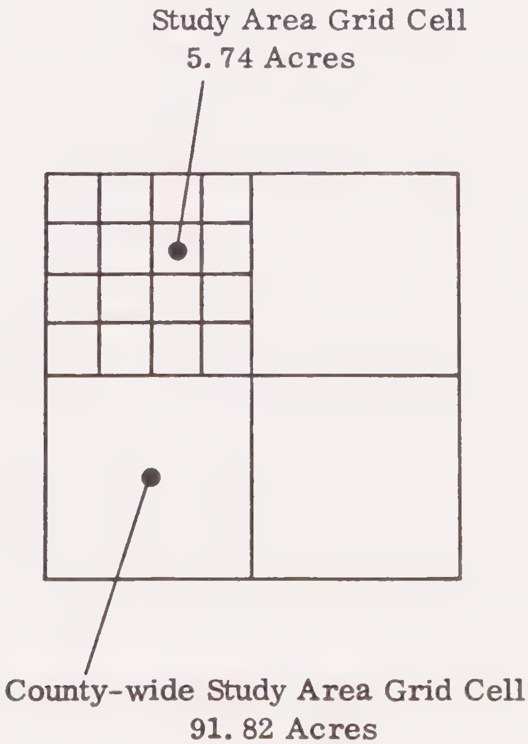
Once the coordinate system has been established, a common spatial unit must be defined for computer analysis and data mapping. Use of a standard grid cell size facilitates creation of the data bank and display of information in a consistent format. Because the data cell size affects not only the spatial accuracy of the analysis but also the cost of the system, these two factors must be balanced in relation to the objectives for which the data system is being designed.

For County-wide data mapping, a grid cell size of 2,000 by 2,000 feet (91.82 acres) was chosen. On gridded base maps at the County-wide scale (1 inch equals 8,000 feet), these grid cells are one quarter inch square. The computer-generated maps also utilize a one quarter inch graphic symbol to represent the information found in each grid cell. Consequently, manually prepared maps and computer maps are at the same scale and can be compared readily.

For computer analysis in the study areas, the grid cell is 500 feet by 500 feet (5.74 acres) and is represented on gridded base maps at a scale of 1 inch equals 2,000 feet by a one quarter inch square. Study area computer maps also are produced at the same scale as the manually prepared study area data maps. A County-wide grid cell at the scale of the study area maps contains 16 study area data cells. The relationship between these two grid cells is shown in the diagram.

Over 10,000 grid cells were used for County-wide analysis, and 35,000 cells for analysis in the study areas.

COMPARISON OF GRID CELL SIZES UTILIZED IN MAPPING ENVIRONMENTAL DATA



Scale: 1 inch = 2,000 feet

The data variables to be included in the computer data bank were selected after assessing what information would be required for the computer analyses. The computer-based data system is not intended to be all-inclusive, but, instead, is designed to respond to the needs of comprehensive planning. As such, the data bank is not an end in itself, but a tool to be used to identify and rank environmental constraints on land use and to indicate the relative suitability of areas within the County for various uses. Where manual techniques are more appropriate for analysis of data, it was not necessary to include that information in the computer data bank. With these principles in mind, 14 data variables were selected for the County-wide computer data file, and 17 data variables for the study area data files. To summarize this computer-based land use and environmental data system, the categories of information are listed in Table 2.

Pertinent land use and environmental data not included in the computer data bank were mapped manually on County-wide and study area base maps. This information was utilized in the analysis process along with the computer maps. In preparing the Conservation Element, major existing and proposed water supply facilities, mineral resources, County-wide agricultural land use and agricultural preserves, historic sites, and archaeological sites were mapped manually.

MAJOR CONSERVATION ISSUES

In preparing the Comprehensive Plan, a number of major conservation issues will have to be addressed. The following section is intended to highlight the major conservation issues facing the County and to provide a perspective on the technical studies presented in the remainder of this report.

Water Resources

State Planning Law (Government Code Section 65302 (d)) requires that the section referring to water resources in the Conservation Element be prepared "in coordination with any county-wide water agency and with all district and city water agencies which have developed, served, controlled or conserved water for any purpose for the county or city for which the plan is prepared." On June 24, 1975, the Santa Barbara County Board of Supervisors, acting as the Water Agency Directors, adopted a Program of Action for Water Resources Planning. The program is designed to "determine the reasonable future water needs of all local facilities currently developed or feasible for development to fulfill such needs, and the requirement, if any, for importation of state project water."* The program is divided into two phases. Phase I involves reconnaissance level studies of the County groundwater

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*Santa Barbara County Water Agency, "What the Water Agency Is and Does," November 1977, p. 1.

TABLE 2. LAND USE AND ENVIRONMENTAL DATA FOR COMPUTER ANALYSIS

County-wide Data

Groundshaking
Tsunamis, seiches
Slope stability and landslides
Compressible or collapsible soils
High groundwater
Liquefaction
Flood hazard
Protection of local water resources
Water supply, by hydrographic unit
Environmental biology
Soils: agricultural capability
Per cent of cell: 0-10 per cent slope
Per cent of cell: 11-20 per cent slope
Per cent of cell: 21-30 per cent slope

Study Area Data

Groundshaking
Tsunamis, seiches
Slope stability and landslides
Compressible or collapsible soils
Soil creep
Expansive soils
High groundwater
Liquefaction
Flood hazard
Protection of local water resources
Municipal and industrial water distribution
Environmental biology
Soil series
Land use
Slope
Elevation
Topography-orientation

basins, present and future water needs, conjuctive use of surface water and groundwater supplies, dam construction, weather modification, wastewater reclamation, desalinization of seawater, State Project water importation, and a preliminary water rights investigation. In addition to these studies, there is to be an environmental analysis of the various water supply alternatives. Phase II, feasibility level, is designed to examine the implementation potential of the alternatives studied in Phase I.

The Water Resources chapter of the Conservation Element is a synopsis of the latest data available at the time of this writing in the above County Water Agency reports. Additional information is provided concerning the protection of the County's water resources. Finally, wastewater production figures are tabulated from the Water Agency report, Present and Future Water Needs of Santa Barbara County, and sewage treatment plant capacities are described.

Ecological Systems

Here, the critical issue facing the County is to determine the relative importance of ecological preservation compared with competing or conflicting goals and objectives. The environmental biologists state that natural systems should be preserved for at least five very compelling reasons. First, they cite the obvious direct benefits that are obtained from ecosystems (food production, watershed protection, etc.), and then they indicate how agricultural productivity depends, in part, on biological diversity. Ecosystems also are storehouses of genetic information and viable outdoor laboratories. Finally, outdoor recreational benefits, which always have been important, will become increasingly valuable with further growth and urbanization of California.

Because the environmental biologists have earmarked less than 30 per cent of the County for preservation (about 275,000 acres) it should be possible to accommodate the goal of biological preservation along with other development goals, except perhaps in areas subject to extreme pressure for urbanization. In several instances, the recommendations of the environmental biologists are in conflict either with current use or with development proposals. Fishing and collecting in coastal areas, development of More Mesa (the habitat of the White-tailed Kite), and overgrazing in the Santa Ynez Valley are three examples that are analyzed in detail, along with other actual or potential conflicts, in the Ecological Systems chapter. Only within the context of the Comprehensive Plan can these competing values be balanced and alternatives assessed. The classification system and the priorities assigned by the environmental biologists

will make the analysis of trade-offs easier. However, the lines that eventually will be drawn to delineate land use will be based not only on the need to preserve ecological communities but also on human, social, and ecomonic needs.

To accomplish preservation of ecological communities, new implementation techniques will be required. Unfortunately, rare and endangered plants do not enjoy the same protection under the law as rare and endangered animals. Nonetheless, ecological preserves can be set up under existing State law (Government Code, Sections 51050-51065), and the County will be able to enter into 20 year open space easement agreements with the owners of lands designated as ecological preserves, once the appropriate ordinances have been adopted instituting such a program. The properties then will be eligible for tax treatment similar to lands in agricultural preserves. In certain areas of ecological importance, especially near urban areas, alternative or supplemental implementation measures may be necessary. The basic issue that must be resolved first is the relative importance of preserving biological diversity compared with other land use needs.

Mineral Resources

A critical issue raised in the mineral resources study stems from the enviromnental impacts of existing and proposed operations. The benefits of new or continued operations in certain areas may not outweigh the damage directly and indirectly attributable to mineral extraction. Often, however, mitigation measures can be utilized to control adverse impacts. Consequently, it is recommended that mineral resource activities be permitted in the County only if adverse impacts would not result, if flooding and erosion problems would not be increased, and if adopted federal and state air and water quality standards would not be violated.

Under requirements of the Surface Mining and Reclamation Act of 1975, the County must "adopt ordinances establishing procedures for the review and approval of reclamation plans and issuance of permits to conduct surface mining operations." Within one year after the State Geologists map areas of mineral deposits, the County must establish resource management policies for incorporation into the Comprehensive Plan. Elsewhere in California, reclamation and ultimate site reuse strategies have proved beneficial, providing opportunities for solid waste disposal as well as for park or recreation facilities.

Future needs and potential deficits of rock, sand, and gravel will become an important issue if growth occurs in certain portions of the County. However, a reasonably exact estimate of the County's future mineral needs and potential deficits cannot be made until the

Comprehensive Plan has been completed and growth and development policies have been adopted. At that time, the County should sponsor a study, in cooperation with the California Division of Mines and Geology, to determine future needs and potential deficits of rock, sand, and gravel and other mineral resources. A similar study in Orange County has been useful in land use planning and in prescribing and administering development regulations.

Agricultural Resources

The County's agricultural preserve program has been extremely successful in bringing 90 per cent of the eligible agricultural acreage under Williamson Act agreements, thereby retaining these lands in agricultural use for the foreseeable future. Contrary to the experience in other California counties, even some farmers whose lands lie adjacent to urban development have participated in the preserve program, demonstrating that they believe in the future of the County's agricultural ecomony. Today, over 500,000 acres have been placed voluntarily in agricultural preserves. In certain instances, however, small holdings, especially orchards, may not be eligible to participate in the program because of the minimum acreage requirements. Consequently, the County is urged to consider reducing the acreage requirements to encourage owners of such properties to place their lands under Williamson Act agreements. The need to preserve existing agriculture and to protect areas suitable for agricultural expansion has to be appraised in light of other pertinent environmental factors and the County's social and economic needs.

Historic Sites and Archaeological Sites

Before programs for the preservation of historic sites and archaeological sites can be formulated, the County must decide how important preserving these resources is in relation to other goals and objectives. If the County believes that a strong preservation program should receive its support, then in can build on the legislation passed in 1966 establishing the Advisory Landmark Committee. The record of the County's historic preservation program is not strong, and a far more aggressive policy will be necessary if significant numbers of sites are to be preserved. The history of archaeological preservation is even spottier. Except through the environmental impact assessment process, little has been done to assess threats to archaeological sites, let alone to undertake actions to preserve or, at last resort, to salvage the sites. In the Conservation Element, archaeologists urge the County to view the remaining sites as the non-living equivalent of rare and endangered species. The same policy also might be applied to the County's outstanding historic sites.

The major role that the County can play in a preservation program is that of a guardian. The County can designate landmarks and impose restrictive conditions to ensure preservation and enhancement of valuable historic sites. Although the County also has the authority to purchase historic buildings and properties, the most likely means of historic preservation probably is not through public ownership. Usually public funds are limited, and other needs often are, or seem to be, more pressing. Instead, the County should encourage the Advisory Landmark Committee and other interested parties to explore alternative means of preservation. To allow sufficient time for this process, the owner of a designated historic property might be required to wait as long as one year before a decision is made on a development proposal for his site. In this way, the Advisory Landmark Committee would have a chance to recruit and screen prospective purchasers and to determine if one would comply with the preservation program. Archaeologists also have pointed out that at least two years between the submission of a development proposal and actual construction is necessary for adequate planning, excavation, and analysis of archaeological sites that are threatened.

Early County action to preserve historic sites and archaeological resources would benefit everyone concerned. Costly delays prior to construction or even during construction would be avoided if adequate steps based on the County's preservation program had been taken early in the development process.

A new source of federal funds to assist local governments implement historic preservation programs might be utilized by the County to expand present efforts. Under the federal Housing and Community Development Act of 1974, counties and cities can use community development block grants for acquisition of sites for historic preservation, and for comprehensive planning that includes surveys of structures and sites of historic and architectural value.

AN INTERIM IMPLEMENTATION MEASURE

In May 1974, the County adopted Ordinance 2576 which creates a Special Problems Committee composed of representatives of various County Departments. The Committee is empowered to prohibit development or to impose special conditions on construction in hazardous areas shown on a "Special Problem Areas" map. Currently, lands subject to flooding and drainage problems in Ballard, Los Alamos, Los Olivos, and Santa Ynez are indicated on the map.

As an interim implementation measure, it is recommended that areas identified as having geologic, seismic and flood problems in the Seismic Safety and Safety Element and areas identified as having water resources protection and drainage problems in the Conservation

Element be added to the "Special Problem Areas" map, and thus become subject to Committee review. By taking this step immediately, even though the Implementation Program later may propose alternative and/or supplementary regulations, it will be possible to prevent development of hazardous areas and to ameliorate hazards incidental to development.

The specific areas that should be indicated on the "Special Problem Areas" map are indicated in a summary fashion below. These factors are discussed in detail in the appropriate chapters of the Seismic Safety and Safety Element and the Conservation Element.

Geologic and Seismic Problems

- Active, potentially active, and historically active faults and a fifty foot zone on either side of the trace of the fault.

- Areas designated in Categories IV and V of the Geologic Problems Index.

Protection of Local Water Resources

- Stream channels recharging groundwater.

- Areas tributary to present major surface water supplies.

- Areas tributary to proposed future major surface water supplies.

Flood Hazard

- Stream channels and floodway areas.

- 100 year flood plain.

- Local drainage problem areas.

Water Resources

OVERVIEW OF WATER QUALITY

The State of California fulfills its responsibility for protection of the quality of water resources through the State Water Resources Control Board and a number of Regional Water Quality Control Boards. Santa Barbara County is within the area covered by the Central Coastal Regional Board. These agencies have two principal roles in the management of water quality. (1) The regional boards establish requirements prescribing the quality of point sources of waste discharge including discharges of municipal wastes, individual industrial waste discharges, and solid waste disposal sites. These waste discharge requirements establish the minimum acceptable quality of the wastes, as measured by those water quality parameters that are of significance for the particular receiving waters to which the wastes are discharged. (2) The State Board, in cooperation with the regional boards, is charged with the responsibility for formulating overall water quality management programs. To accomplish this task, the Board contracted for the preparation of basin water quality management plans for each of the basins in the State. The management plan for the Central Coastal Area was adopted in April 1975. This basin plan contains a recommended program for management of the quality of the water resources in the County, as well as encourages the use of reclaimed water.

Control of nonpoint sources of pollution (e.g., sedimentation, pesticides, animal wastes, salinity) are the subject of a water quality management plan to be completed by the State Water Resources Control Board in December 1978.

Surface Water Supplies — The surface water supplies developed by the reservoirs on the Santa Ynez River generally are of satisfactory mineral quality containing somewhat in excess of 500 milligrams per litre of total dissolved solids. Some taste and odor problems result from polysulfides contained in the influent seepage into Tecolote Tunnel, but means of alleviating this problem are being investigated. Otherwise, conventional treatment is sufficient to produce acceptable water for domestic purposes. Such treatment is provided by Goleta County Water District and the City of Santa Barbara, and is under consideration by the Montecito, Summerland, and Carpinteria County Water Districts. No significant present degradation of surface water supplies due to waste discharges occurs, and the regulatory powers of the Regional Board are adequate to prevent such degradation from point source discharges.

Groundwater Supplies — The principal concern with quality of groundwaters is their mineral content. Part of the mineral content of the groundwaters occurs naturally. Surface runoff, which eventually contributes to the recharge of groundwater, dissolves minerals from the soil and rock with which it comes in contact and thereby acquires some mineral content. Some additional mineralization may occur by solution of minerals, both from the aquifer materials and from the materials lying between the surface of the ground and the water table, after the surface waters have percolated. Some increase in mineralization also occurs from point sources of waste discharge (municipal waste waters, industrial wastes, etc.). To the extent that the mineral content of these wastes is greater than that of the underlying groundwater, the groundwater salinity will be increased. For example, municipal waste waters typically contain total dissolved solids concentrations that exceed those of the source water by 300 milligrams per litre or more. Therefore, pumpage of groundwater for municipal purposes, and subsequent return of the effluent to the groundwater basin, results in some increase in salinity of the underlying groundwater.

Other point sources of waste discharge include solid waste disposal sites and industrial wastes, particularly those from mineral extraction activities and oil production activities. Such discharges must conform with standards established by the Regional Water Quality Control Board. The specific requirements for a particular industrial activity and the constraint which such requirements might place on either the development or continued existence of such an activity would have to be evaluated on a case-by-case basis.

Point source waste discharges have not been major contributors to groundwater salinity increases in the past. In the South Coast area, the major point source waste discharges are those of effluent originating from the municipal waste collection and treatment systems. These municipal wastes currently are discharged to the ocean and consequently are not returned to groundwaters. In the northern portion of the County, municipal wastes are, in many cases, returned to groundwater. However, the amounts of municipal wastes and other point source discharges historically have been small in relation to total water use, which is primarily agricultural. Provided that present South Coast waste disposal practices continue, point source waste discharges will not contribute significantly to groundwater salinity. However, should there be any major expansion of point source discharges, such as large-scale use of highly mineralized reclaimed municipal waste water for ground water replenishment, significant increased mineralization of the underlying groundwater could result.

The major contribution to increased salinity of groundwaters comes from diffuse sources of wastes, especially from the percolation below the root zone of that portion of the water applied to plant growth, either to irrigated agriculture or to landscaped areas, which exceeds the amount

consumptively used (evaporated and transpired) by the plants. The other major diffuse contribution of waste to groundwaters is from septic tanks in areas that do not have a sewerage system for the collection, treatment, and disposal of domestic wastes. When water is applied for irrigation, including irrigation of landscaping in urban areas, a substantial portion of the applied water is removed by evaporation and transpiration. As a result, the salts originally contained in the applied water are concentrated in the remaining unconsumed portion. To these salts are added any additional salt contributions from fertilizers, soil amendments, and the like, as well as possibly some additional salt dissolved from the soil. If the irrigated lands overlie groundwater without an intervening clay layer, then the relatively highly mineralized irrigation return water can reach the groundwater body. Irrigation of lands overlying unconfined groundwater probably has contributed to increases in groundwater salinity in the past and is likely to continue to contribute to such salinity increases in the future. The magnitude of this problem and possible solutions are covered in the basin water quality management plan prepared for the State Water Resources Control Board.

Although localized problems may have occurred in the past, it is not believed that the use of septic tanks has contributed significantly to historical groundwater degradation on a basin-wide basis. The extent of any future basin-wide problems resulting from septic tanks will depend on the density of development. No studies are known to have been made of the maximum density of development that should be tolerated with septic tanks used as the means of domestic waste disposal. At present, the use of septic tanks is evaluated on a case-by-case basis by the County Public Works and Health Departments.

If groundwater levels are drawn below sea level in aquifers in hydraulic continuity with the ocean, saline water ultimately will intrude into the aquifer. In the South Coast area, a series of faults lying between the ocean and the groundwater bodies restricts the passage of water and provides some protection against salt water intrusion. However, sufficient data are not available to establish that such protection is fully effective, particularly in situations where groundwater levels are maintained substantially below sea level for long periods of time. In the Lompoc Plain, no known barrier to intrusion of seawater exists, and, accordingly, such intrusion conceivably could occur if groundwater levels were maintained below sea level. In the Santa Maria Valley, continued lowering of water levels near the coast could result in future seawater contamination of the groundwater basin.*

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* Santa Barbara County Water Agency, "Adequacy of the Santa Maria Groundwater Basin," December 1977, p. S-10.

PROTECTION OF WATER RESOURCES

Developments in areas tributary to major surface water supplies or overlying or tributary to groundwater should be compatible with the protection of these water resources. Accordingly, lands in the County were categorized with respect to their relationship to such water sources.

Category 1, Stream Channels Recharging Groundwater — Areas were categorized as stream channels if review of U.S. Geological Survey quadrangle sheets indicated that the area drained by such streams would be significant and if the stream channel was located over unconsolidated materials, thereby permitting recharge to usable underlying groundwater bodies. Reaches of stream channels that overlie consolidated rock or confined groundwater were not classified in the category. Additionally, portions of some stream channels which have been lined to reduce flood hazard, with the effect of preventing recharge from the stream to the underlying groundwater body, were not classified in Category 1.

In many cases, usage other than light recreational activities could endanger the percolation capacity of such areas. Any use should be subject to controls which would prevent damage to the recharge capability, obviate liability problems, and eliminate possible hazards.

Category 2, Areas Tributary to Present Major Surface Water Supplies — Facilities providing significant surface water supplies that were considered in defining Category 2 include Gibraltar, Jameson, and Cachuma reservoirs along with several small reservoirs located north of Goleta and Santa Barbara on the coastal side of the Santa Ynez Mountains. Twitchell Reservoir was excluded from Category 2 because its primary purpose is to provide groundwater recharge.

In this category, activities should not be permitted that would significantly degrade the quality of the surface water supplies or increase silt production. Accordingly, the amount of development should be limited, and controls should be imposed on development to prevent deleterious effects. Light recreational activities should cause few problems, provided that sanitary pollution from such usage is prevented and erosion is not increased. Intensive recreational usage could be somewhat more of a problem because of the potentially greater sanitary pollution load resulting from more people using the area.

In the case of agricultural use and intensive recreation, the salinity of return flows, the possible presence of nutrients (nitrates and phosphates) which could stimulate algal growth in reservoirs, and the

erosion potential must be evaluated. Irrigated lands also contribute such trace constituents as pesticides, but this is not a major problem in the County. Waste loads resulting from excessive numbers of livestock tributary to surface water supplies likewise should be considered. For example, construction of a feedlot above Cachuma Reservoir obviously could create problems. The effects of agricultural uses are a question of degree. Some agriculture above surface water supplies can be tolerated, but if the amount of agricultural development becomes excessive, the problems may become too severe to be tolerated.

In urban areas, sanitary and industrial wastes and surface runoff are the prinicpal sources of pollution. Land grading in connection with development may increase erosion and silt production. Obviously, the greater the total amount of urban development, the greater the potential for problems.

The question of usage of lands tributary to surface water supplies primarily involves the extent of development which should be permitted. It would be difficult to place a specific upper limit on the amount of development which might be acceptable. However, most of the lands in the County that are tributary to surface water supplies have limited development potential due to other factors.

<u>Category 3, Areas Tributary to Proposed Future Major Surface Water Supplies</u> — The only two proposed surface water supplies classified in this category were Salsipuedes and Round Corral reservoirs. The Lompoc Project was not placed in this category, because federal funding of this project is unlikely. The comments on Category 2 also apply to this category.

<u>Category 4, Areas Overlying Unconfined Groundwater</u> — Clay layers overlying groundwater bodies were delineated from information in U.S. Geological Survey publications and other reports, including reports prepared by various consultants, and from discussions with the County Farm Advisor. Because the available data are somewhat limited, and in some cases conflicting, the definition of the boundaries of Category 4 lands must be considered as very rough at best.

Any irrigation of Category 4 lands, whether they be in agricultural or urban use, generally will tend to increase the salinity of underlying groundwaters. In addition, urban development increases the amount of overlying impervious surface, thereby reducing replenishment of the groundwater from precipitation. All other things being equal, it would be preferable that development take place on lands other than those in Category 4. However, all other things seldom are equal, and from many other standpoints these may be very desirable lands for development. Consequently, although classification in Category 4 involves some constraint on development, the degree of such constraint is not major.

Point sources of groundwater pollution pose more serious problems. For example, a site for the disposal of decomposable organic solid wastes within a Category 4 area should not be permitted if the decomposition of such wastes threatens groundwater quality. Industrial activities involving land disposal of unacceptable waste materials also should not be permitted in Category 4 areas. The Regional Water Quality Control Board's regulation of waste discharges should solve these problems.

Category 5, Areas Tributary to Groundwater — Category 5 was defined using U.S. Geological Survey data to delineate consolidated materials, and maps showing topography to determine areas that are tributary to groundwater bodies. These areas are comprised mainly of mountainous lands surrounding valley floors, as well as rock outcrop areas within the valley floors themselves. The area tributary to Twitchell Reservoir was classified in this category because the primary purpose of the reservoir is to recharge groundwater through use of the Santa Maria and Cuyama River channels.

The comments on Category 2 and 4 also apply to Category 5, except that the problems created by sanitary wastes, although warranting consideration, are not as critical with respect to groundwater as they are to surface waters. The process of percolation through the soil and through the materials that make up the aquifer are quite effective in the removal of sanitary pollution.

Category 6, Areas Not Tributary to Water Resources — Areas in this category include the coastal mountain ranges from which runoff flows directly to the ocean without passing over significant groundwater bodies, and areas underlain by extensive clay layers which prevent recharge to the main groundwater body of water applied at the surface. One of the largest of these confining layers occurs on the valley floor west of Lompoc, and confined water areas also exist in the Goleta and Carpinteria basins. In such confined groundwater areas, precipitation or application of water to the surface of the land in excess of consumptive use requirements cannot return to the main groundwater basin and will either run off or will form perched water tables. The boundaries of these Category 6 areas should be considered as approximate because of the limited extent of available data.

The County-wide and study area maps of protection of local water resources show the general distribution of these categories. Larger scale maps may be seen in the office of the County Planning Department.

Area Analysis of Protection of Local Water Resources

Category 2, encompassing the areas tributary to present surface water supplies, consists only of the headwaters area of the Santa Ynez River above Bradbury Dam.

Category 3, lands tributary to proposed surface water supplies, includes the major portion of the Sisquoc River watershed tributary to the site of the proposed Round Corral Dam, currently being studied by the U.S. Bureau of Reclamation. Category 3 also includes the portion of the Santa Ynez Mountains tributary to the proposed Salsipuedes Dam on Salsipuedes Creek, which is under study as a possible source of water supply for the Lompoc Area.

Category 4, lands overlying unconfined groundwater, comprises the major portion of the valley floors in the Cuyama Valley, Santa Maria Valley, San Antonio Valley, Lompoc Plain, Santa Ynez Valley, and South Coast, as well as the upland areas of low relief adjoining the Santa Maria Valley, San Antonio Valley, Lompoc Plain, and Santa Ynez Valley.

The major portion of the mountainous area of the County which is not tributary to exisitng or proposed major surface water supplies is tributary to groundwater and, therefore, is shown in Category 5.

Category 6, lands not tributary to significant surface or groundwater resources, includes some mountainous and hilly areas immediately adjacent to the coast, particularly the southern slope of the Santa Ynez Mountains west of Gaviota. Other Category 6 areas are those overlying confined groundwater, including the western portion of the Santa Maria Valley, the western portion of the Lompoc Plain, and some areas on the South Coast lying near the shoreline.

Santa Barbara County
Protection of Local Water Resources

Category 1:
Stream Channel Recharging Groundwater

Category 2:
Area Tributary to Present Major Surface Water Supplies

Category 3:
Area Tributary to Proposed Future Major Surface Water Supplies

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater

Category 6:
Area Not Tributary to Water Resources


State Route 166
CUYAMA RIVER
NEW CUYAMA
CUYAMA
SAN LUIS OBISPO COUNTY
KERN COUNTY
GUADALUPE
SANTA MARIA
SANTA MARIA RIVER
POINT SAL
RIVER
Zaca Lake
LOS PADRES NATIONAL FOREST
PURISIMA POINT
VANDENBERG AIR FORCE BASE
SURF
LOMPOC
POINT ARGUELLO
LAS CRUCES
GAVIOTA
POINT CONCEPTION
SANTA YNEZ RIVER
State Route
VENTURA COUNTY
MONTECITO
CARPINTERIA
SUMMERLAND
SANTA BARBARA
N
PROTECTION OF LOCAL WATER RESOURCES

South Coast Study Area ~ East
Protection of Local Water Resources

Category 1:
Stream Channel Recharging Groundwater

Category 2:
Area Tributary to Present Major Surface Water Supplies

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater

Category 6:
Area Not Tributary to Water Resources


LOS PADRES NATIONAL FOREST
STUDY AREA BOUNDARY
VENTURA COUNTY
SANTA BARBARA COUNTY
MONTECITO
SUMMERLAND
CARPINTERIA
SANTA BARBARA
Canyon Road
East Valley Road
Sycamore
Foothill Road
Linden Ave
Casitas Pass Road
N
PROTECTION OF LOCAL WATER RESOURCES

South Coast Study Area ~ West
Protection of Local Water Resources

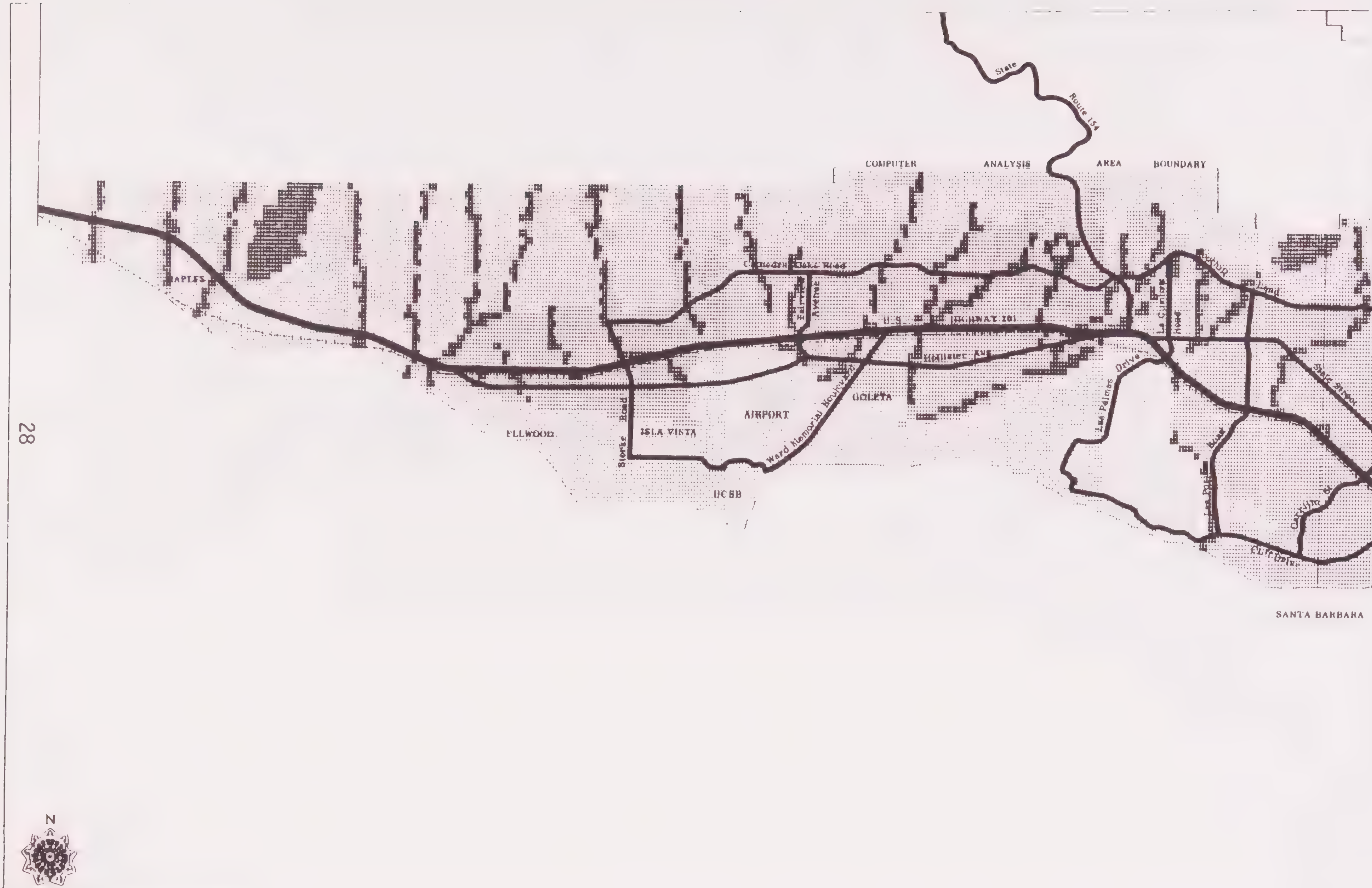
Category 1:
Stream Channel Recharging Groundwater

Category 2:
Area Tributary to Present Major Surface Water Supplies

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater

Category 6:
Area Not Tributary to Water Resources

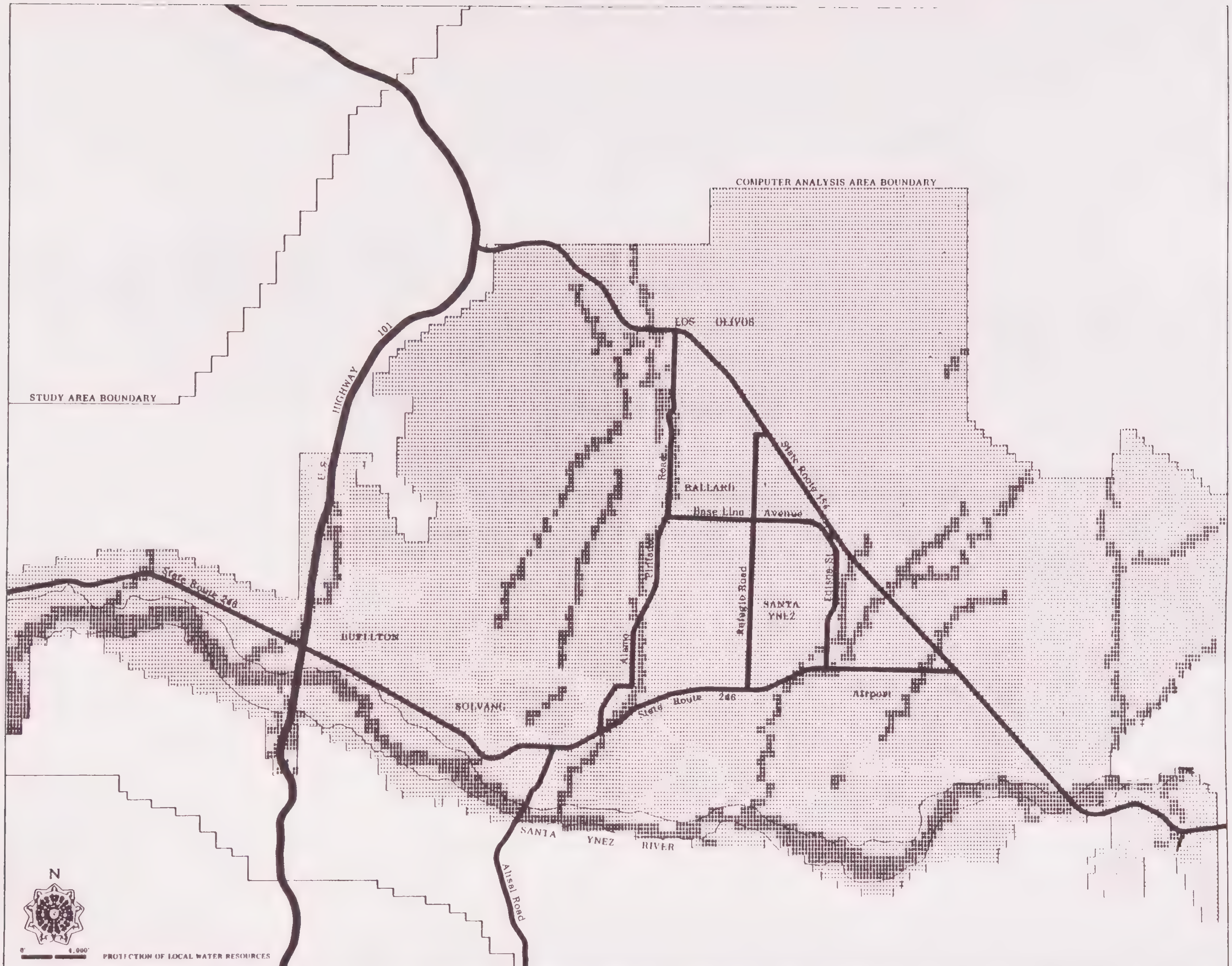

State Route 154
COMPUTER ANALYSIS AREA BOUNDARY
Hollister Ave
GOLETA
AIRPORT
ISLA VISTA
ELLWOOD
UCSB
Storke Road
Ward Memorial Boulevard
Las Palmas Drive
SANTA BARBARA
N

Santa Ynez Valley Study Area
Protection of Local Water Resources

Category 1:
Stream Channel Recharging Groundwater

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater


COMPUTER ANALYSIS AREA BOUNDARY
STUDY AREA BOUNDARY
U.S. HIGHWAY 101
LOS OLIVOS
BALLARD
Base Line Avenue
State Route 154
Alamo Pintado Road
Refugio Road
SANTA YNEZ
BUELLTON
SOLVANG
State Route 246
Airport
SANTA YNEZ RIVER
Alisal Road
N
4,000'
PROTECTION OF LOCAL WATER RESOURCES

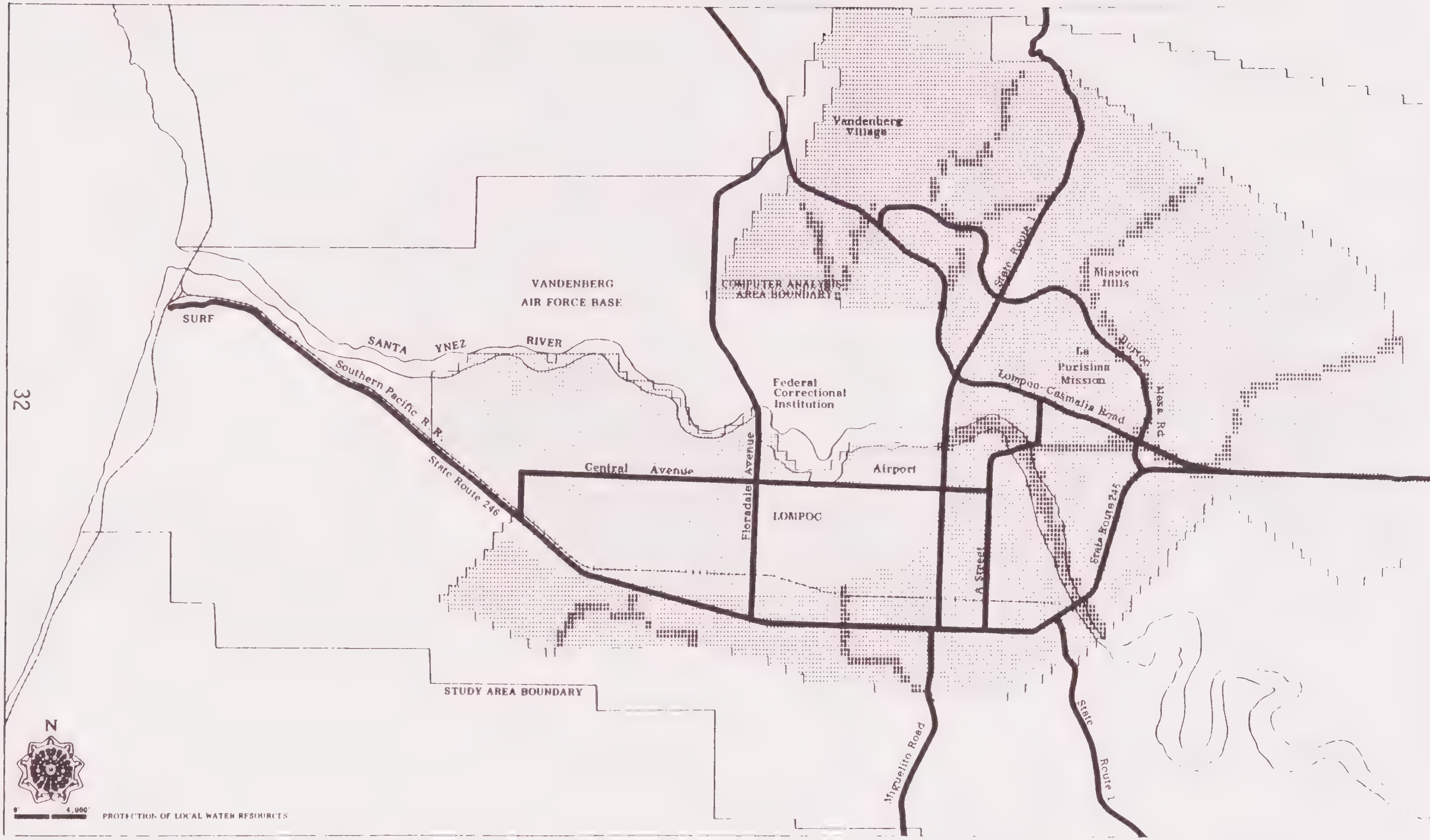
Lompoc Study Area
Protection of Local Water Resources

Category 1:
Stream Channel Recharging Groundwater

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater

Category 6:
Area Not Tributary to Water Resources



Vandenberg Village
COMPUTER ANALYSIS AREA BOUNDARY
VANDENBERG AIR FORCE BASE
SURF
SANTA YNEZ RIVER
Southern Pacific R.R.
State Route 246
State Route 1
Mission Hills
La Purisima Mission
Burton Mesa Rd
Lompoc-Casmalia Road
Federal Correctional Institution
Central Avenue
Floradale Avenue
Airport
LOMPOC
A Street
State Route 246
STUDY AREA BOUNDARY
Miguelito Road
State Route 1
N
0' 4,000'
PROTECTION OF LOCAL WATER RESOURCES

Santa Maria-Orcutt Study Area
Protection of Local Water Resources

Category 1:
Stream Channel Recharging Groundwater

Category 4:
Area Overlying Unconfined Groundwater

Category 5:
Area Tributary to Groundwater

Category 6:
Area Not Tributary to Water Resources


SAN LUIS OBISPO COUNTY
SANTA BARBARA COUNTY
SANTA MARIA RIVER
GUADALUPE
State Route 166
SANTA MARIA
COMPUTER
ANALYSIS
AREA
BOUNDARY
Santa Maria Valley R.R.
Blosser Road
Betteravia Road
STUDY AREA
BOUNDARY
BETTERAVIA
Santa Maria
Airport
POINT SAL
Point Sal Beach
State Park
State Route 1
State Route 135
U.S. HIGHWAY 101
ORCUTT
VANDENBERG AIR FORCE BASE
Southern Pacific R.R.
CASMALIA
N
PROTECTION OF LOCAL WATER RESOURCES

PRESENT WATER SUPPLIES AND FUTURE WATER DEMANDS

The following sections of this chapter summarize and extract information from the Santa Barbara County Water Agency (SBCWA) reports prepared pursuant to the Agency's Program of Action for Water Resources Planning. These extensive documents were written in cooperation with the various water purveyors within the County, the Public Utilities Commission, the County Health Department, city planning agencies and public works departments, and the County Planning Department. The reader is referred to the Water Agency reports for detailed discussion of the complex water issues, study assumptions, and data sources. A list of the reports is provided in the Bibliography of this Conservation Element. As further information or updated figures become available, it will be included as addenda to the element.

Local Water Conditions*

Santa Barbara County's water resources consist of groundwater and surface water supplies. The groundwater basins shown on the following map are the major source of water in the County, providing over 85 percent of the total applied water County-wide. Regardless of future decisions on supplemental water, groundwater will remain the major water source. In general, the available supply of groundwater is termed the "safe yield" of the basin. Safe yield is defined as follows:

- Safe yield for extractions means that a particular quantity of water may safely be extracted from the basin annually without causing a long-range decrease in the amount of water in storage, provided that the current arrangement of water use does not change significantly and cause less applied water to return to the basin by deep percolation than is currently the case.
- Safe yield for consumptive use, or for net extractions, means that the amount stated can be completely removed from the groundwater basin without causing a long-range loss of groundwater storage.

The safe yield is subject to change when there are changes in cultural conditions such as the amount of agricultural acreage, type of sewage disposal and extent of impervious surface area. Consideration must also be given to potential adverse environmental effects including subsidence and seawater intrusion.

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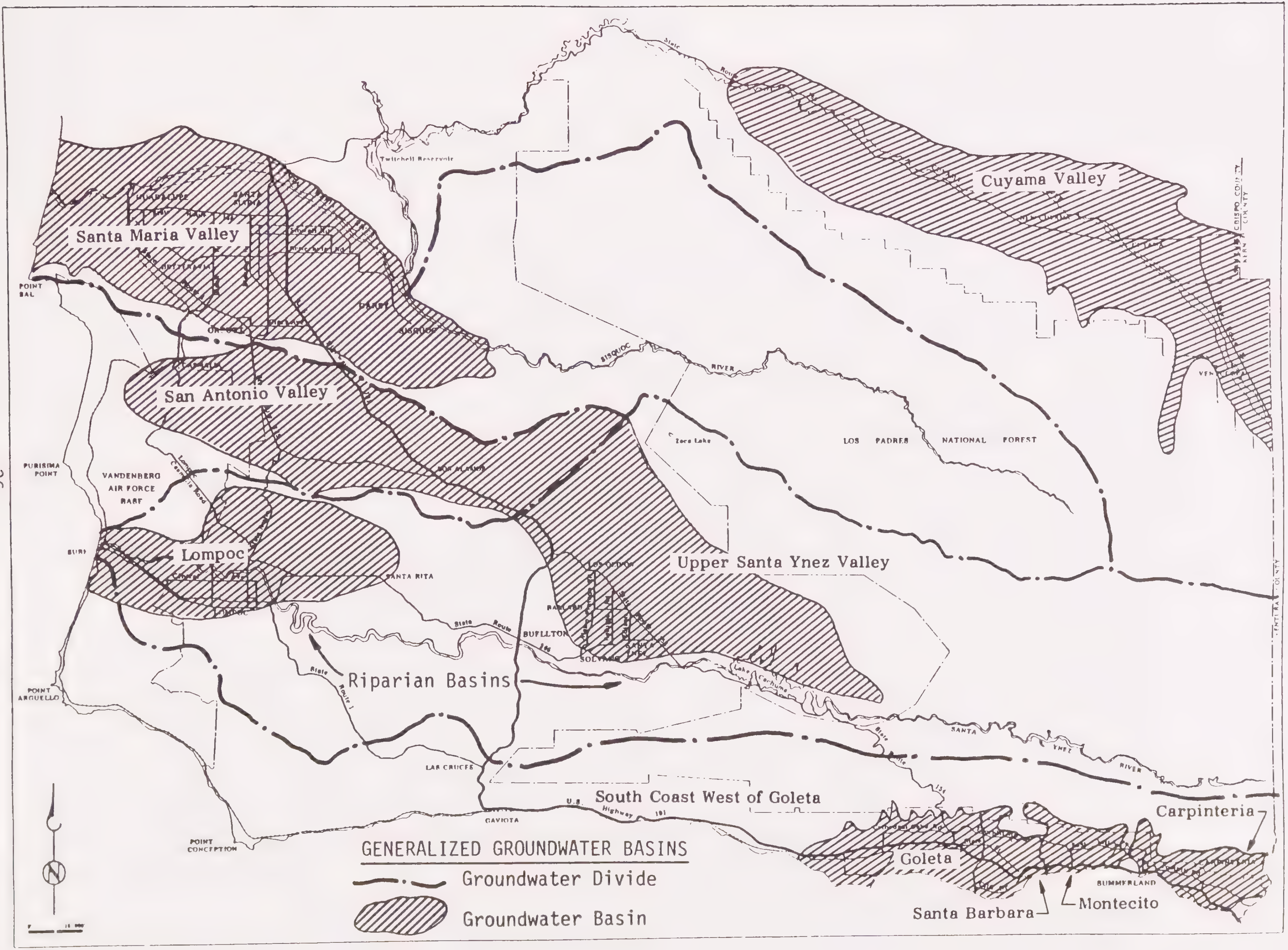
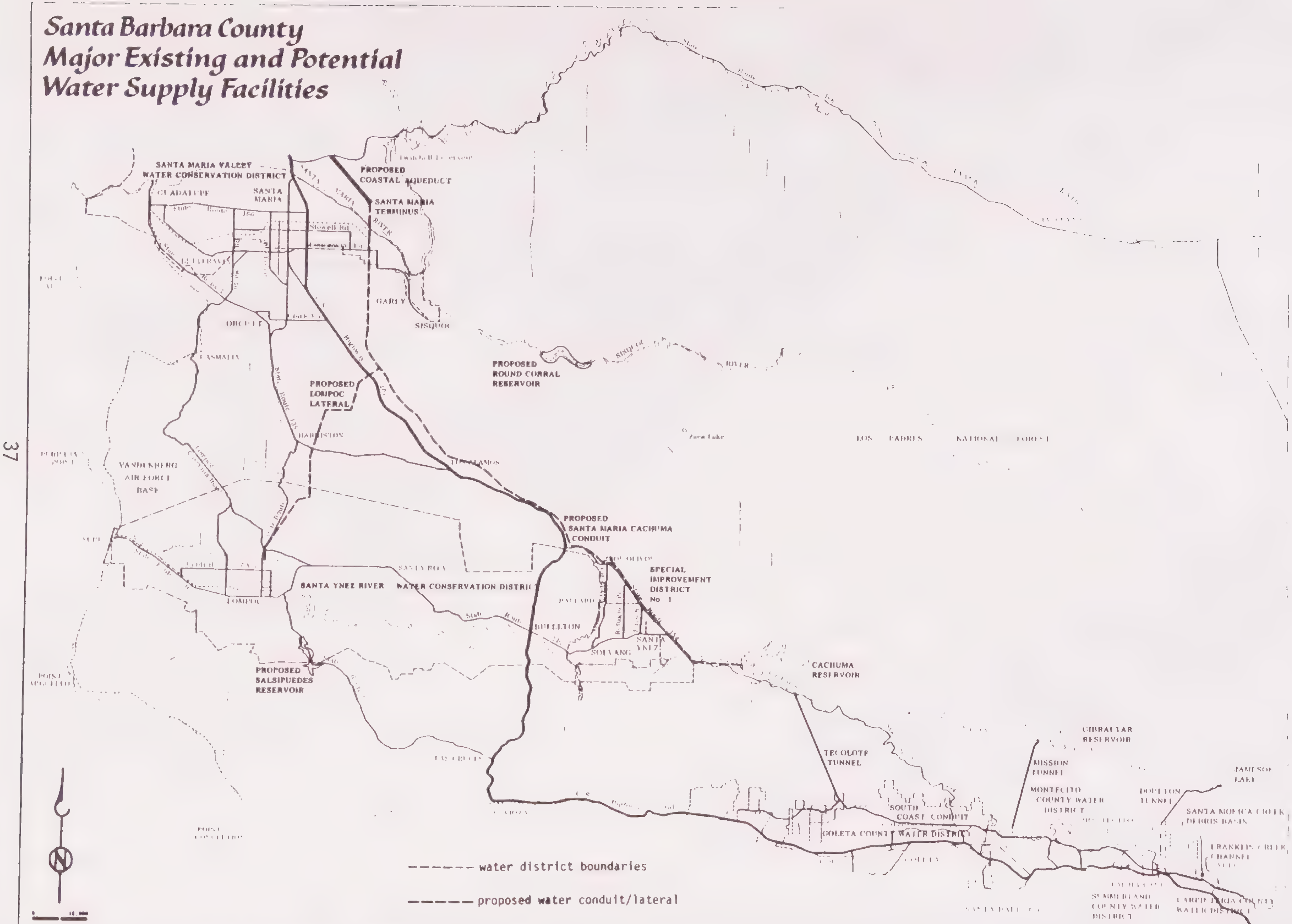
* Sources: Santa Barbara County Water Agency, Present and Future Water Needs of Santa Barbara County, 2nd ed., January 13, 1978; Water Needs Versus Water Availability, November 29, 1977; Adequacy of the Groundwater Basins of Santa Barbara County, December 15, 1977.


Santa Maria Valley
San Antonio Valley
Cuyama Valley
Lompoc
Upper Santa Ynez Valley
Riparian Basins
South Coast West of Goleta
Carpinteria
Goleta
Santa Barbara
Montecito
POINT SAL
PURISIMA POINT
VANDENBERG AIR FORCE BASE
POINT ARGUELLO
POINT CONCEPTION
SANTA RITA
BUELLTON
SOLVANG
LAS CRUCES
GAVIOTA
SUMMERLAND
LOS PADRES NATIONAL FOREST
SISQUOC RIVER
SANTA YNEZ RIVER
Twitchell Reservoir
GENERALIZED GROUNDWATER BASINS
Groundwater Divide
Groundwater Basin



Santa Barbara County
Major Existing and Potential
Water Supply Facilities
SANTA MARIA VALLEY
WATER CONSERVATION DISTRICT
PROPOSED
COASTAL AQUEDUCT
SANTA MARIA
TERMINUS
SANTA
MARIA
GUADALUPE
GAREY
SISQUOC
ORCUTT
CASMALIA
PROPOSED
ROUND CORRAL
RESERVOIR
PROPOSED
LOMPOC
LATERAL
LOS ALAMOS
LOS PADRES NATIONAL FOREST
VANDENBERG
AIR FORCE
BASE
PROPOSED
SANTA MARIA CACHUMA
CONDUIT
SPECIAL
IMPROVEMENT
DISTRICT
No. 1
SANTA YNEZ RIVER WATER CONSERVATION DISTRICT
LOMPOC
BUELLTON
SOLVANG
SANTA
YNEZ
CACHUMA
RESERVOIR
PROPOSED
SALSIPUEDES
RESERVOIR
TECOLOTE
TUNNEL
GIBRALTAR
RESERVOIR
MISSION
TUNNEL
MONTECITO
COUNTY WATER
DISTRICT
DOULTON
TUNNEL
JAMESON
LAKE
SANTA MONICA CREEK
DEBRIS BASIN
FRANKLIN CREEK
CHANNEL
SOUTH
COAST CONDUIT
GOLETA COUNTY WATER DISTRICT
SUMMERLAND
COUNTY WATER
DISTRICT
CARPINTERIA COUNTY
WATER DISTRICT
water district boundaries
proposed water conduit/lateral
N

Groundwater quality trends are difficult to interpret because of the numerous variables and uncertainties in the data. The long-range quality effects are usually very gradual and unpredictable. As a result, the SBCWA groundwater report examines water quality in relation to present conditions, with some possibilities given for the future.

The County's surface water supplies consist of Cachuma, Gibraltar, and Jameson reservoirs along the Santa Ynez River. Twitchell Reservoir is used for replenishment of groundwater in the Santa Maria Valley, and is considered as an adjunct of the groundwater supply. Reclaimed wastewater irrigates a small amount of agricultural land and is counted as surface water supply.

Members of the Cachuma Project and the firm yield of the project to each member are shown in Table 1. The firm yield represents the amount of water that each member can rely upon as its projected Cachuma supply.

Yields from Gibraltar Reservoir have been estimated by Don Owen and Associates (1976) at 7,400 acre feet per year (AFY) for current conditions, 7,000 AFY in 1980, 5,400 AFY in 1990 and 4,200 AFY for year 2000. Included in these figures is an average 500 AFY infiltration in Mission Tunnel.

Jameson Lake yields were estimated by Brown and Caldwell consultants (1977) at 1,490 AFY, 1,440 AFY, and 1,390 AFY for 1980, 1990, and the year 2000, respectively. This includes infiltration from Doulton Tunnel and runoff from Fox Creek.

Summary tables showing water use and supply conditions are reproduced from the Water Agency reports at the end of this section.

TABLE 1

CACHUMA PROJECT ALLOCATIONS OF ENTITLEMENT AND SURPLUS WATER AMONG THE MEMBER UNITS OF SANTA BARBARA COUNTY WATER AGENCY

Member Unit	1975-80 (4)	1980-85 (5)	1985-90 (6)	1990-95 (7)
City of Santa Barbara				
E-O, AFY	6,800	7,900	9,100	10,300
E-O, Percent	(30.769)	(30.739)	(31.271)	(32.188)
Surplus, AFY	1,754	646	[407]	[1,352]
Total Firm Yield, AFY	8,554	8,546	8,693	8,948
Goleta CWD				
E-O, AFY	7,400	8,800	10,200	11,600
E-O, Percent	(33.484)	(34.241)	(35.052)	(36.250)
Surplus, AFY	1,909	719	[456]	[1,523]
Total Firm Yield, AFY	9,309	9,519	9,744	10,077
Summerland CWD				
E-O, AFY	300	400	400	400
E-O, Percent	(1.357)	(1.556)	(1.375)	(1.250)
Surplus, AFY	77	33	[18]	[52]
Total Firm Yield, AFY	377	433	382	348
Montecito CWD				
E-O, AFY	1,900	2,400	2,800	2,900
E-O, Percent	(8.597)	(9.339)	(9.622)	(9.063)
Surplus, AFY	490	196	[125]	[381]
Total Firm Yield, AFY	2,390	2,596	2,675	2,519
Carpinteria CWD				
E-O, AFY	2,400	2,900	3,300	3,500
E-O, Percent	(10.860)	(11.284)	(11.340)	(10.938)
Surplus, AFY	619	237	[147]	[459]
Total Firm Yield, AFY	3,019	3,137	3,153	3,041
Santa Ynez RWCD				
E-O, AFY	3,300	3,300	3,300	3,300
E-O, Percent	(14.932)	(12.840)	(11.340)	(10.313)
Surplus, AFY	851	270	[147]	[433]
Total Firm Yield, AFY	4,151	3,570	3,153	2,867
Santa Barbara CWA, AFY				
Total E-O	22,100	25,700	29,100	32,000
Safe Yield	27,800	27,800	27,800	27,800
Available Surplus	5,700	2,100	[1,300]	[4,200]

Notes

- The numbers in parentheses below the years shown as the column headings represent period numbers for the Cachuma contract. Period one began in 1960-65. These last four periods are shown for they relate to current and projected Cachuma supplies as discussed in this report.
- "E-O" stands for "Entitlement-Obligation."
- The numbers in parentheses shown for each member unit represent their entitlement-obligation percentage. This percentage is applied to the total "available surplus" shown at the bottom of the table to arrive at the surplus figures shown for each area for each period.
- Numbers shown in brackets represent negative numbers.
- The "total firm yield" represents what the member units can depend upon receiving.

Carpinteria-Summerland Area: The Carpinteria groundwater basin is one of several south coast basins situated along a narrow alluvial plain between the Santa Ynez mountains and the Pacific Ocean. The basin proper underlies approximately 7,600 acres. The safe yield for extractions has been estimated at 4,500 acre feet per year (AFY). A consultant study* indicated demand on the basin amounting to approximately 1,800 AFY for private water pumpage, and 2,000 AFY for the Carpinteria County Water District, totaling 3,800 AFY.

The groundwater quality is considered generally acceptable, although it has been slowly deteriorating. Salt accumulation in the basin totaled 4,670 tons/year (1975 conditions), and is projected to reach 5,180 tons/year from existing sources by the year 2000. Seawater intrusion does not appear to be a problem in the deeper aquifers, but may be present in the shallow coastal aquifers.

The Carpinteria County Water District (CCWD) includes 9,205 acres, serving 11,650 people (1975 Special Census). In addition to groundwater use, the CCWD imports water from the Cachuma Project. The current total firm yield allocated to the district is 3,019 AFY.

The Summerland County Water District comprises 757 acres and is estimated by the Water Agency to have served 1,100 people in 1976. Because there is no groundwater supply in this area, Cachuma Project water is Summerland's only supply. The total firm yield for the current period is 377 AFY. An increase in irrigated agriculture, primarily lemons, caused the district's total water demand to be greater than its supply, resulting in a water hookup moritorium on October 16, 1974.

Montecito Area: The Montecito groundwater basin underlies approximately 4,300 acres. The current safe yield for extractions is estimated to be 1,200 AFY. Demands on the basin for 1975 conditions included 100 AFY of Montecito County Water District pumpage and 300 AFY private pumpage.

Groundwater quality is considered to be acceptable for domestic usage throughout the basin. Due to a lack of data, no trends can be seen. However, an increase in groundwater demand would probably lead to some degradation in quality. Salt accumulation totaled 2,560 tons/year (1975 conditions), and is projected to increase to 2,800 tons/year in the year 2000. The Rincon Thrust Fault appears to be an effective barrier to seawater intrusion.

The Montecito County Water District encompasses 8,359 acres and includes 9,711 people (1975 Special Census). The district received an average annual delivery from Jameson Lake and Doulton Tunnel of 2,194 acre feet for the 1970-75 period. The Cachuma Project supplied Montecito with an average of 2,264 acre feet during the Cachuma water years 1970-71 through 1975-76. The Montecito County Water District has been under a

* Geotechnical Consultants, Inc., March 3, 1978.

water hookup moratorium and allocation program since January 18, 1973 and May 1973, respectively.

Santa Barbara Area: The Santa Barbara groundwater basin underlies a predominantly urbanized area of 3,400 acres. The safe yield forextractions is estimated at 2,500 AFY. Surface supplies available to the City of Santa Barbara include Cachuma Project entitlement, diversions from Gibraltar Reservoir (including infiltration from Mission Tunnel), contractual deliveries of Jameson Lake water by the Montecito County Water District of about 300 AFY, and minor amounts of water from Cold Springs Tunnel, totaling 16,250 acre feet for 1975-76. Groundwater pumpage by the City was approximately 510 acre feet during the 1975-76 Cachuma year, with private pumpage from the basin currently estimated at 200 AFY.

Water quality trends show a condition of accelerating degradation. These trends may slow or be reversed due to Water Agency projections which indicate lessened groundwater pumpage and rising water levels. Under 1975 conditions, net salt accumulation within the basin amounted to 5,140 tons/year, projected to decrease to 2,600 tons/year by the year 2000. As with the Montecito and Carpinteria groundwater basins, the Rincon Thrust Fault appears to act as an effective barrier to seawater intrusion.

The City of Santa Barbara Water Resources Department serves 68,500 people (1975 Special Census) within an area of 11,330 acres which includes the City (excluding the Hope Avenue neighborhood), Mission Canyon, and small "island" sections of Goleta and Montecito.

Goleta Valley Area: The Goleta groundwater basin underlies approximately 11,000 acres. Safe yield for extractions is estimated by the Water Agency to average 4,000 AFY.

Mineral concentrations vary significantly among the sub-basins of the Goleta Basin. The water quality data indicate that most of the Goleta groundwater is acceptable for domestic use. Projected future groundwater demands imply an increase in groundwater pumpage which could mean an acceleration in water quality degradation. Net salt accumulation for 1975 was 7,570 tons/year, and is projected to improve to 6,450 tons/year. Seawater intrusion was suspected in the Goleta Slough area; however, observation wells exhibited high concentrations of sulfate, a mineral not normally found in significant quantities in seawater. It is therefore believed that these concentrations are due to the presence of native saline waters in the basal Santa Barbara formation.

The Goleta County Water District (GCWD) is the largest south coast water district, covering 33,000 acres. The population served is estimated to be 74,100.* The district relies mostly on Cachuma Project water as its source of supply. During the water year 1975-76 the GCWD did not pump from its wells. Deliveries from Cachuma that year

*Includes areas inside Santa Barbara City served by the Goleta W.D. but excludes areas in Goleta served by the City.

amounted to 16,382 acre feet. In the prior year, however, groundwater pumpage amounted to 3,250 acre feet. Private well production for the 1975-76 year was 1,953 acre feet (including 1,470 acre feet pumpage by the La Cumbre Mutual Water Company). A water hookup moritorium has been in effect for this district since December 1972.

The La Cumbre Mutual Water Company serves the Hope Ranch area within the Goleta County Water District, and buys water wholesale from the GCWD. In addition, La Cumbre maintains four of its own wells to augment production capacity. 1975-76 water use was 1,770 acre feet (1,470 acre feet pumpage plus 300 acre feet deliveries from the GCWD).

South Coast West of Goleta:

The Ellwood to Gaviota area covers approximately 105 square miles of the southern coastal part of Santa Barbara County. Groundwater occurs in the consolidated rocks and in the alluvial filled stream valleys. The USGS has estimated that the average annual recharge to this area is approximately 6,000 AFY which was proposed as an upper limit on the safe yield for this area. Until a more detailed geohydrologic investigation of the Ellwood-Gaviota area is conducted, this figure is accepted as the best available estimate of groundwater safe yield. Agricultural water demand for this area is estimated by the Water Agency to be 1,720 AFY, of which 750 AFY are served by the Goleta County Water District. Because of the relatively small amount of municipal and industrial land use, water use for these categories has not been calculated.

The Gaviota to Point Conception area covers about 36 square miles. The safe yield of this area is tentatively estimated by the Water Agency to be approximately 2,000 AFY, based on a comparison with the Ellwood-Gaviota area. Current water demands in the Gaviota-Point Conception area are estimated to be 150 AFY from the Hollister Ranch.

Santa Ynez Valley Area: The Santa Ynez Uplands groundwater basin is an area of unconsolidated deposits covering about 88,000 acres north of the Santa Ynez River. The Water Agency estimates the present safe yield for extractions of this area at 11,000 acre feet. The net pumpage for municipal, industrial and agricultural demands under 1975 conditions was 12,550 acre feet, plus natural water losses (e.g., base flow out of system and phreatophyte* consumptive use) of 1,000 acre feet.

Consistent groundwater quality data in the Santa Ynez Uplands are not available to determine the overall conditions or quality trends in the basin. However, well samples do indicate that the groundwater is of relatively high quality. There is a net salt accumulation of 2,780

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* "Phreatophyte": deep-rooted plant that obtains its water from the groundwater basin or the layer of soil just above it.

tons/year (1975 conditions), projected to drop to 2,500 tons/year in the year 2000 due to reduced imports from Lake Cachuma.

The Santa Ynez Valley is served by the Santa Ynez River Water Conservation District, Improvement District Number 1 (SYRWCD, I.D. #1); Solvang Municipal Improvement District (SMID); Cachuma Community Services District; and many small mutual water companies and private wells.

SYRWCD, I.D. #1 encompasses approximately 10,000 acres in a triangular area deliniated by Solvang, Santa Ynez, and Los Olivos. SMID is a separate service district which lies entirely within I.D. #1. Its area includes 1,380 acres comprising the town of Solvang and extending south to Alisal Ranch and Golf Course. The 1975 Special Census indicated that 6,530 persons lived within I.D. #1 boundaries, with 2,440 of these residing in Solvang.

Both I.D. #1 and SMID operate wells and augment groundwater with Cachuma Project water. In the 1975-76 Cachuma Water Year, I.D. #1 received 4,219 acre feet from Cachuma, selling 226 acre feet of this to SMID. Total groundwater produced for I.D. #1 and SMID was 2,060 acre feet, for a total surface and groundwater production of 6,279 acre feet. Private wells are numerous in this area and are used primarily for agricultural irrigation. Within the I.D. #1 boundaries, private pumpage amounts to approximately 4,500 AFY. Total private pumpage of water for domestic purposes is estimated to be 150 AFY.*

The Cachuma Community Services District includes the 840 acre area surrounding Lake Cachuma. The County of Santa Barbara provides water and sewer service to approximately 200 permanent residents and 20 park rangers. Water from Lake Cachuma is the only source of supply, amounting to 142 acre feet in 1975.

The Buellton Community Services District (BCSD) encompasses 558 acres in and around the town of Buellton. The 1976 population was estimated by the BCSD to be 2,000 persons. Groundwater provides the only source of water to this area through two district wells. Annual water production averages 420 acre feet. One of these wells has high total disolved solids and excess iron and manganese content. The State Department of Health has required that this water be treated. The BCSD is currently seeking funding for the project.

The State Department of Health has set a limit of 650 connections to the BCSD until the treatment plant is completed and a new well is drilled. A new well was begun but had to be abandoned until more funding becomes available. As of 1977, there were 527 connections to

*inside and outside I.D. #1

the BCSD. The district provides no water for agricultural irrigation. Private agricultural pumpage is estimated by the Water Agency in 1975 to total approximately 8,600 AFY. Additional domestic private pumpage is estimated at 10 AFY.

The Santa Ynez River riparian basins form a narrow strip along the Santa Ynez River from Bradbury Dam west 33 miles to a narrow area at the edge of the Lompoc Plain. In 1975, about 10,000 acres of irrigated truck, field, pasture, deciduous, ornamental, and vineyard crops were supported by the ripairian basins. Additionally, there is some pumpage from the river deposits for the industrial uses in Solvang and Buellton areas as noted above, and for private homes and farms along the river. The safe yield for the riparian basins is a direct function of demand on the basins, rather than being a maximum fixed yield as determined by net natural recharge and imports. This is because the basins are replenished essentially by releases from Cachuma Reservoir to satisfy prior water rights (unless Cachuma is spilling).#

Lompoc Area: There are four groundwater basins that are interconnected hydraulically in the Lompoc area: Lompoc Plain (lying below and south of the Santa Ynez River as it crosses the valley floor), Lompoc Uplands (within which both Vandenberg Village and Mission Hills are located), Lompoc Terrace (hilly area bordering the southwest part of the Lompoc Plain), and the Santa Rita Valley (upstream of the Lompoc Narrows on a tributary to the Santa Ynez River).*

Current (1975-76) long-term recharge to the Lompoc Plain subarea is estimated to be about 13,900 AFY. Discharge from these areas is attributable to consumptive use** by municipal and industrial users, agricultural users, phreatophytes, and outflow to the ocean. Total discharge from the Lompoc Plain area is estimated at 16,400 AFY under mid-1970's conditions, so that discharge exceeds recharge by 2,500 AFY.

In the Uplands subarea, discharge is attributable to consumptive use by Vandenberg Village, the Village Country Club and Mission Hills areas, estimated to be about 1,850 AFY. Average recharge to this area is estimated at 2,000 AFY, implying that recharge exceeds discharge over this area by 150 AFY. In the Santa Rita Valley, however, the consumptive use is about 1,600 AFY, almost entirely agricultural, with recharge being 650 AFY. Therefore, the local overdraft in the Santa

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* See Santa Barbara County Water Agency, "Adequacy of the Groundwater Resources in the Lompoc Area," July 27, 1977.

** "Consumptive Use"--water permanently removed from the system.

#There are also riparian areas along Salsipuedes and El Jaro Creeks south of the Santa Ynez River. These areas cover about 2 miles and contain about 970 acres of irrigated ag that demand about 1,500 AFY. In addition, north of the Santa Ynez River there is a small riparian area along Santa Rosa Creek and its tributaries. This area covers 11 miles and contains about 750 acres of irrigated ag that demand about 1,425 AFY.

Rita portion of the Upland basin is about 950 AFY; or, taking the Upland area as a whole, the overdraft totals 800 AFY.

Discharge from the Lompoc Terrace is about 150 AFY to Vandenberg Air Force Base, with average recharge estimated at 400 AFY.

According to the County Water Agency (1977), the total long-term mean recharge to the Lompoc area is about 17,000 AFY. The 1975-76 conditions estimated discharge from the same area is about 20,000 AFY. The Lompoc area is therefore estimated to be in a state of overdraft at about 3,000 AFY, in terms of consumptive use.**

The mineral quality of water in the Lompoc Plain is generally poor and a trend exists toward further mineralization. This is primarily due to agricultural irrigation, with a secondary contribution from municipal wastewater effluent in the riverbed. Water quality in the Lompoc Upland and Terrace is somewhat better and appears to be stable. Salt accumulation amounts to 7,550 tons/year, projected to increase to 9,170 tons/year.

No known barrier to seawater intrusion exists in the Lompoc area. The County Water Agency advises that, if projections of future groundwater depletion are reasonably correct, "planning should begin in the relatively near future for measures to protect the basin against potential long-range seawater intrusion."*

Water service in the Lompoc area is provided by the following agencies and firms: The City of Lompoc Water Division supplies water to 22,557 persons within a service area of 3,200 acres; the Federal Correctional Institution (FCI) Utilities Department serves 1,682 persons; in the Vandenberg Village area, service is provided by the Park Water Company to an estimated population of 6,500; and in the Mission Hills area, the Mission Hills Water Company produces and distributes water to an estimated 3,000 persons (1975 Special Census).

Vandenberg Air Force Base (VAFB) covers an area of 98,400 acres and has 10,048 permanent residents. The Base produces its water supply from three separate groundwater basins: The Lompoc Plain, Lompoc Terrace, and San Antonio Groundwater Basin, totaling 4,146 acre feet in 1975. VAFB sells an average 675 AFY to the FCI.

The City of Guadalupe, included here within the Lompoc Area because it is in the Fourth Supervisorial District with Lompoc, provides service to approximately 3250 persons (based on State

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*"Adequacy of the Groundwater Resources in the Lompoc Area," p. 36
**"According to the County Water Agency, the estimated 1977-78 overdraft for the entire Lompoc Groundwater Basin is about 1,750 AFY. This is a reduction from the 1975-76 estimate of 3,000 AFY, and is due to consumer conservation and, particularly, to the diversion of municipal and industrial wastewater from the Vandenberg Village system to the Lompoc Regional Wastewater Treatment Plant."

Department of Finance figures, 1975) in the incorporated city area of 465 acres. Water is pumped from wells in the confined Guadalupe subarea of the Santa Maria Groundwater basin. Production amounted to 850 acre feet in 1975. Water quality is marginal.

Santa Maria-Orcutt Area: This area is coterminous with the Fifth Supervisorial District and includes the City of Santa Maria and the unincorporated communities of Los Alamos, Casmalia, Orcutt, Sisquoc, Garey, Cuyama and New Cuyama. The groundwater basins are the principal source of water for these areas.

The San Antonio Valley groundwater basin underlies 66,000 acres located between, and in hydraulic continuity with, the Lompoc Uplands basin to the south and the Santa Maria groundwater basin to the north. The basin is separated from the coastal environment by about 7 miles of consolidated non-water-bearing rocks, and thus is not subject to the dangers of seawater intrusion. Total recharge to the basin amounts to 8,500 AFY for present conditions, while total discharge amounts to 11,500 AFY. Safe yield for extractions is estimated at 9,200 AFY. The basin thus has an overdraft for consumptive use of about 3,000 AFY.
Vandenberg Air Force Base began extractions from the west end of the basin in 1963, and averaged 1,500 AFY until 1976, when they pumped out 2,440 acre feet. Other municipal and industrial pumpage amounts to 386 AFY, with the Los Alamos Community Services District distributing 150 AFY to a population of about 570, and Union Oil Company providing 156 AFY to Casmalia, serving a population of about 200. Net pumpage for agricultural irrigation is estimated at 7,600 acre feet, and phreatophyte consumption and natural outflow totals 1,100 acre feet.

Water quality analyses by the U.S. Geological Survey indicate that San Antonio Valley basin groundwater is of better quality than in most areas of the County. Quality levels have remained fairly constant over time and are expected to remain so in the future. Under present conditions, net salt accumulation within the basin is estimated at 470 tons/year. With projected increases in VAFB groundwater exportation, there will be a net salt removal of 975 tons/year by the year 2000.

The Santa Maria groundwater basin* underlies approximately 77,000 acres in northern Santa Barbara County and 30,000 acres in southern San Luis Obispo County. Total average annual recharge to the basin is about 85,000 AFY. Removal of groundwater for 1975 conditions amounts to 6,000 AFY for subsurface outflow to the ocean, 85,800 AFY for agricultural irrigation, and 13,250 AFY for municipal and industrial use. These figures exclude about 7,000 AFY return to the basin from effluent

* See Santa Barbara County Water Agency, "Adequacy of the Santa Maria Groundwater Basin," November 1977.

percolation and reclamation for irrigation of pasture crops. The sum of net pumpage suggests total disposal of about 105,000 AFY. The difference between estimated net recharge of 85,000 AFY and disposal of 105,000 AFY indicates an overdraft for consumptive use of 20,000 AFY under current conditions. The corresponding current overdraft for extracts is estimated at 28,000 AFY. While the current overdraft is significant, the Water Agency does not see this as alarming in view of the substantial amount of freshwater in storage above sea level, estimated at 2 million acre feet.

Water quality conditions vary within the Santa Maria Valley, generally deteriorating from east to west, laterally from the Santa Maria River. The use and reuse of groundwater, coupled with the introduction of additives resulting from both municipal and agricultural use, and evaporation of much of the applied water, result in increasingly mineralization of the groundwater. Shallower wells would probably be affected more than the deeper wells. The net salt accumulation (1975 conditions) is estimated at about 48,500 tons/year, with projected accumulation in the year 2000 of about 56,600 tons/year.

The City of Santa Maria Water Division provides service to most of the incorporated area of 9,710 acres. The public airport and unincorporated community of Orcutt are served by the Southern California Water Company. The City water system extends past the City limits to provide service to a mobile home park on West Main Street and to Stubbs Lane, Prescott Lane, and Goodwin Road. The Water Division estimates the current population of its service area to be 34,750 (1975 Special Census recorded 33,645).

Groundwater from the Santa Maria basin provides all of the needs of the City. Twitchell Reservoir supplies an estimated 21,200 AFY for recharge to the basin. The City produced 8,033 acre feet in 1976. Private pumpage for agricultural irrigation in the Santa Barbara County portion of the basin was estimated by the Water Agency to be 94,420 acre feet in 1975. Private pumpage for industry amounted to an estimated 1,700 for oil industry, 2,350 AFY for Western Refrigeration Company, 1,050 AFY for Sinton and Brown Company, 1,350 AFY for Union Sugar, and 1,000 AFY for livestock, totaling 7,450 AFY. Private pumpage for domestic use comes from small water companies that serve mobile home parks or a small group of houses. Among the companies near the City limits are Trailerancho Park; St. Marie Park, Inc.; Rosemary Farms; and Foster Road Mutual Water Company, totaling approximately 100 AFY.

In the Orcutt Area, water is supplied by the California Cities Water Company to a population of 18,500 (1975, Water Agency estimate) within an area of about 7,000 acres, including Tanglewood. Total 1975 water production was 3,849 acre feet. Private well production for agricultural purposes is minimal in this area. The 120 acre Rancho Maria

Golf Course requires about 260 acre feet annually. Private pumpage for domestic purposes is used by the Rolling Hills Water Association, a small, mutual water company with 40 connections. Production figures were not available.

Water service for the Lake Marie area is provided by the Lake Marie Water Company. The total water service area is about 2 square miles, with a population of about 506 persons (1975 Special Census). Water production amounted to 316 acre feet in 1976.

The Sisquoc area comprises the southeasterly portion of the Santa Maria groundwater basin. This agricultural area has two small towns, Sisquoc and Garey. Garey is served by individual wells. For the town of Sisquoc, water is supplied by the Southern California Water Company to approximately 200 people (1975) within an area of 100 acres. Water production has been 21 AFY since 1972.

The Cuyama Valley groundwater basin underlies about 255 square miles within four counties. One hundred twenty-seven square miles are in Santa Barbara County, 41 square miles in San Luis Obispo County, 2 square miles in Kern County, and about 85 square miles in Ventura County. The safe yield for extractions is estimated to be 10,600 AFY. Under 1975 conditions, the overdraft for extraction amounted to about 50,000 AFY, with the corresponding overdraft for consumptive use at about 37,000 AFY.

Water quality is generally deteriorating, although quality varies from one area to another due to the great extent of the basin and concentrations of pumping in certain areas. Salt accumulation amounts to 12,000 tons/year, projected to decrease due to reduced irrigated agricultural acreage.

In the town of Cuyama, water is supplied by the Cuyama Mutual Water Company. Due to water quality problems, the County Health Department has required that bottled water be supplied by the company to its customers. In New Cuyama, the State Department of Health has imposed a moratorium on service connections until quality problems are solved.

Other Areas: These areas include small communities which are not served by large companies or water districts. Examples include Lake Cachuma Recreational Area, Cachuma Village, Rosario Tract Water Company, Santa Ynez River area above Lake Cachuma, and Zaca Lake. The Water Agency estimates that total water use for these areas is about 780 AFY (1975 conditions).

Table 2 REVISED 6/78

SUMMARY OF SUPPLIES AND DEMANDS FOR SANTA BARBARA COUNTY IN 1975 (CURRENT)[6]

(in acre-feet)

Area or Basin	Available Supplies: Surface Water[1]	Available Supplies: Ground Water[2]	Total[3] Available Supply	Estimated[4] Demand	Supply[5] -Demand	Remarks
Carpinteria Basin	3,020	4,500	7,520	7,800	- 280	The actual surface water deliveries to CCWD in 1975 were greater than their firm yield due to available surplus. Recent (3/78) reports by Geo-technical Consultants indicate demands via private pumpage may be 500 AF less than assumed here.
Summerland Area	380	-	380	200	+ 180	Summerland shows a surplus despite their existing moratorium due to the current young age of some agricultural crops that are ex-pected to consume the "surplus" when full-grown.
Montecito Basin	3,620	1,200	4,820	4,400	+ 420	Montecito shows a surplus, but facilities do not exist with which to extract the water. Also, currently claimed water rights limit allowable extractions. Recent studies have also indicated that the safe yield may be less than that shown here.
Santa Barbara Basin	16,250	2,500	18,750	16,050	+ 2,700	Santa Barbara greatly benefits from its Gibraltar system.
Goleta Basin	9,310	4,200	13,510	17,600	- 4,090	The actual surface deliveries to GCWD in 1975 were greater than the volume shown, due to the availability of surplus water. Additional NRS water was taken in advance to fulfill the demand.
Ellwood to Gaviota Area	-	<6,000	<6,000	1,720	+ 4,280	Goleta-West Conduit water delivered to this area are included as part of the total supply and demand on the Goleta Basin not the Ellwood-Gaviota area.
Gaviota to Point Conception Area	-	2,000±	2,000±	150	+ 1,850	
Santa Ynez Up-lands Basin	3,950	11,000	14,950	16,550	- 1,600	
Santa Ynez Riparian Basins:(Cachuma to Lompoc Narrows + Salsipuedes)	200	25,350	25,550	25,550	-	Cachuma water was supplied to SMID. It is assumed throughout this report that supplies in the Santa Ynez Riparian Basins will equal demands. This is a result of the live stream criteria as modified by the New Release Schedule, which allows an accumulation of downstream release credits.
Santa Ynez Riparian Basins:(upstream of Cachuma)	-	780	780	780	-	

Table 2 (cont'd)

REVISED 6/78

	Available Supplies					
Area or Basin	Surface Water 1/	Ground Water 2/	Total 3/ Available Supply	Estimated 4/ Demand	Supply 5/ -Demand	Remarks
Lompoc Area (Uplands, Terrace, Plain and Santa Rita Uplands)	(280)	23,400	23,400	28,120	- 4,720	
San Antonio Vly Basin	-	9,200	9,200	13,050	- 3,850	
Santa Maria Basin	(2,100)	110,100	110,100	138,050	-27,950	This represents the total demand on the basin both in SB and SLO Counties. The SB County portion of the demand is 114,550 AFY (23,500 AFY in SLO County).
Cuyama Basin	-	10,600	10,600	68,450	- 57,850	This represents the total demand on the basin both in SB and SLO Counties. The SB County portion of the demand is 31,975 AFY (36,475 AFY in SLO County).
TOTAL	36,730	210,830	247,560	338,470	-90,910	The SLO Co. demands are reflected in these totals.

Footnotes for Table 2:

1/ Surface water supplies represent total firm yields from the Cachuma Project for Period 4 and estimated yields for Gibraltar and Jameson. They do not represent actual 1975 deliveries. The values shown in ( )'s represent wastewater used to meet local agricultural demand. This volume has been included in the assessment of the GWB safe yield as well as part of the total demand. Surface supply includes Cachuma Project entitlement-obligations with allocated surplus (or shortage), Gibraltar Project used conjunctively with Santa Barbara's Cachuma surplus and groundwater, and Jameson Lake operated on a safe yield basis. Operation of Gibraltar, with diversions in excess of that allowable by the Gin Chow Decree may actually reduce the Cachuma firm yield somewhat (not reflected herein).

2/ In most cases the current safe yield for the groundwater basins as shown here are for extractions and were calculated assuming overdrafting to meet the demands.

3/ Total Available Supply is the sum of the surface water supplies and the groundwater basins safe yields for extractions.

4/ Estimated Demand represents both agricultural and M&I demands by public and private purveyors.

5/ Supply minus Demand is the result of the two previous columns. Positive numbers indicate surpluses, while negative numbers indicate deficits.

6/ Table does not show any water resource development not currently underway.

TABLE 3

SUMMARY OF URBAN AND AGRICULTURAL WATER USE (1975)

A. URBAN CONDITIONS

Locality	Population	Water Use (AFY)*
South Coast Region	169,233	34,700
Santa Ynez Valley Region	10,428	3,200
Lompoc Region	43,793	10,500
San Antonio Valley Region	1,025	400
Santa Maria Valley Region	56,138	20,100
Cuyama Valley Region	1,030	400
Total Santa Barbara County	281,647	69,300

B. AGRICULTURAL CONDITIONS

Locality	Irrig. Acres	Water Use (AFY)
South Coast Region	11,045	13,250
Santa Ynez Valley Region	8,528	31,000
Lompoc Region	15,234	29,000
San Antonio Valley Region	4,715	10,000
Santa Maria Valley Region	38,983	94,000
Cuyama Valley Region	6,534	32,000
Total Santa Barbara County	85,039	210,000

Total Water Use (AFY)
279,300

Source: Santa Barbara County Water Agency

* All water use numbers have been rounded.

TABLE 4

SUMMARY HYDROGEOLOGIC PROPERTIES

Groundwater Basin	Area (acres)	Annual Rainfall (inches)	Storage Capacity Total (x1000)	Storage Capacity Useable[b/]	Avg. Specific Yield (%)	Well Production Yield (gpm)	Well Production Specific Capacity (gpm/ft)	Safe Yield for Extractions (acre-feet)
Carpinteria	7,600	15.8	700	50	12	200-1,200	2.0-12	4,500
Montecito	4,300	17.8	120	10	7	200	1.0-2.0	1,200
Santa Barbara	3,400	17.8	184	35	11	200-800	7.0	2,500
Goleta	11,000	18.6	260	50	10	200-1,000	7.5	4,200
Ellwood to Gaviota	67,200	19.7	-	-	-	25	1.0	6,000
Gaviota to Pt. Conception	23,000	18.0	-	-	-	25	1.0	2,000
Santa Ynez Uplands	88,000	16.0	10,000	500	8	500-1,600	1-20	11,000
Santa Ynez River Riparian Basins	12,100	14-18	92	80	20	500-1,800	10-500	-
Lompoc	44,000	14.2	300	100	12	200-2,000	10-140	23,400
San Antonio	66,000	15.0	2,100	300	10	500-1,000	6-19	9,200
Santa Maria	107,000	13.4	10,000	2,000	14	500-3,000	10-300	110,100
Cuyama	163,200	6-12	10,000	1,000	15	500-4,000	10-300	10,600

a/ Estimated from Santa Barbara County isohyetal map prepared by the County Flood Control Department.

b/ Useable storage capacity is herein defined as the maximum amount of groundwater that may be extracted from a basin in support of a conjunctive use program without producing irreversible negative impacts. In most cases, useable capacity refers to the quantity of water in storage above sea level or alternatively, the maximum historical groundwater depletion below a full basin condition.

TABLE 5

SUMMARY OF GROUNDWATER QUALITY

Average Quality Range (mg/1)

Groundwater Basin	Total Dissolved Solids (TDS)	Total Hardness[a] (TH)	Sulfate (SO_4)	Cloride (CL)	Nitrate (NO_3)
Carpinteria	500 - 1,200	300 - 700	50 - 400	40 - 200	0 - 100
Montecito	700 - 1,000	170 - 470	110 - 240	40 - 160	na
Santa Barbara	550 - 800	300 - 600	100 - 300	30 - 130	na
Goleta	650 - 1,000	170 - 600	200 - 350	40 - 300	0 - 20
Ellwood to Gaviota	600 - 2,000	50 - 800	100 - 700	30 - 200	1 - 3.5
Gaviota to Pt. Conception	na[b]	na	na	na	na
Santa Ynez Uplands	470 - 700	280 - 550	20 - 230	30 - 150	1 - 20
Santa Ynez River Riparian Basins	600 - 1,000	400 - 550	250 - 1,000	20 - 280	0 - 20
Lompoc	500 - 2,000	250 - 1,000	100 - 750	100 - 300	1 - 40
San Antonio	400 - 900	200 - 700	10 - 300	80 - 200	0 - 30
Santa Maria	500 - 3,000	400 - 1,000	250 - 1,000	50 - 150	na
Cuyama	500 - 2,100	370 - 1,300	140 - 1,200	na	5 - 60
State Department of Health (Recommended/ upper limit)	500/1,000	—	250/500	250/500	10/10

[a] Concentrations greater than 100 mg/1 are considered "hard." Concentrations less than 100 mg/1 are considered "soft."

[b] na: not available

TABLE 6

SUMMARY OF PROJECTED GROUNDWATER BASIN CONDITIONS

Groundwater Basin	Seawater Intrusion Potential				Water Level Decline (ft/yr) a/				Overdraft (AFY for extractions) b/			
	1975	1980	1990	2000	1975	1980	1990	2000	1975	1980	1990	2000
Carpinteria	low	low	low	mod.	-	.8	1.7	2.1	-	940	1,940	2,400
Montecito	low	low	low	mod.	-	.7	2.1	3.0	-	370	1,225	1,675
Santa Barbara	low	low	low	low	-	-	-	-	-	-	-	-
Goleta	low	low	low	low	-	4.0	7.4	10.0	-	4,730	9,480	13,390
Ellwood to Gaviota	-	-	-	-	-	-	-	-	-	-	1,840	5,200
Gaviota to Pt. Conception	-	-	-	-	-	-	-	-	-	1,200	2,000	4,050
Santa Ynez Uplands	-	-	-	-	0.7	1.0	4.5	3.1	1,600	6,470	5,240	5,280
Santa Ynez River Riparian Basins	-	-	-	-	-	-	-	-	-	-	-	-
Lompoc	low	low	mod.	high	0.7	0.8	1.0	1.0	4,720	4,940	6,980	7,550
San Antonio	-	-	-	-	1.6	3.7	2.8	2.8	850	8,280	6,300	6,330
Santa Maria	low	low	mod.	high	1.0	1.6	1.6	1.9	32,550	38,300	38,540	39,420
Cuyama	-	-	-	-	8.0	7.7	4.5	1.2	57,850	55,220	32,040	8,860

a/ Determined using average specific yield assuming water levels decline at a uniform rate throughout the groundwater basin. Average annual groundwater depletion rate calculated from net water supply deficit figures in Water Needs Versus Water Availability in Santa Barbara County, SBCWA, November 1977.

b/ The indicated overdraft is calculated under the assumption that future demands are met from existing sources of supply and therefore does not include inputs from potential supplemental sources.

The future demands are based upon moderate urban and ag expansion assuming no water supply restrictions after 1980.

Future Water Demands

Table 7 summarizes County Water Agency projections of water resources for each decade to year 2000. These estimates were generally based on County Planning Department population projections,*per capita water consumption values, and water duties, and have been reconciled with information supplied by the local water purveyors and city planning agencies. The November 1975 Special Census of Santa Barbara County was used as a reference point for all population data.

In order to show potential water supply conditions, it was assumed that no supplemental supplies (e.g., conjunctive use, wastewater reclamation, water importation) would be obtained. However, allowance was made for the effects of moderate municipal and industrial consumer conservation of water. Table 8 indicates the range of potential water savings. The low figures on this table represent minimum acceptance of conservation efforts by consumers; the higher figures represent anticipated maximum acceptance.

Estimates of agricultural water use, which represents the greatest water demand in the County, were based on power consumption for groundwater pumping and by crop acreages compared with appropriate water use factors. Future agricultural water demand was calculated using two methods: by examining the conventional agricultural considerations including water availability, soil type, climate, slope, drainage, cropping practices, potentially developable acreage, and economics; and by means of a linear programming model (explained in Present and Future Water Needs). The Water Agency utilized values between these two theoretical agricultural water use levels.

With respect to total water supply and total water demand for Santa Barbara County, including demands for San Luis Obispo County areas within the Santa Maria Valley and Cuyama Valley, the Water Agency notes the following:

Item	1975	1980	1990	2000
Total Water Demand, AFY				
w/Cuyama Basin	338,480	258,660	346,470	336,490
w/o Cuyama Basin	270,030	292,840	303,835	317,030
Total Water Supply, AFY				
w/Cuyama Basin	247,560	248,670	246,540	247,270
w/o Cuyama Basin	236,960	238,070	235,940	236,670
Total Deficit, AFY				
w/Cuyama Valley	99,920	109,990	99,930	89,220
w/o Cuyama Valley	33,070	54,770	67,895	80,360

*and projected land use changes as shown on the 1965-78 Land Use Plans.

TABLE 7

CURRENT AND PROJECTED STATUS OF WATER AVAILABILITY

Volume of Water Remaining or Deficit
Based Upon Applied Water Demands and
Groundwater Basin Safe Yield for Extractions
(Values are in acre feet per year)*

Area or Basin	1975	1980	1990	2000
Carpinteria	(280)	(940)	(1,940)	(2,400)
Summerland	180	40	(190)	(310)
Montecito	420	(370)	(1,220)	(1,670)
Santa Barbara	2,700	3,650	1,350	350
Goleta)	(4,090)	(4,730)	(9,480)	(13,390)
Ellwood to Gaviota)**	4,280	2,800	(1,840)	(5,200)
Subtotal, South Coast	3,210	450	(13,320)	(22,620)
Gaviota to Point Conçeption Area	1,850	(1,200)	(2,000)	(4,050)
Santa Ynez Uplands	(1,600)	(6,470)	(5,240)	(5,280)
Santa Ynez Riparian Basins (Inc. Sals.)***	0	0	0	0
Lompoc Area	(4,720)	(4,940)	(6,980)	(7,550)
San Antonio Valley	(3,850)	(8,280)	(6,300)	(6,330)
Santa Maria Basin	(27,950)	(34,300)	(34,040	(34,520)
Subtotal, w/o Cuyama Basin	(33,060)	(54,740)	(67,880)	(80,350)
Cuyama Basin****	(57,850)	(55,220)	(32,040)	(8,860)
Total, Santa Barbara County	(90,910)	(109,960)	(99,920)	(89,210)
ROUND OFF	(90,900)	(110,000)	(99,900)	(89,200)

Source: SBCWA, Water Needs Versus Water Availability, November 29, 1977.

Notes to Table 7:

* Deficits are shown in parentheses. All numbers are approximate, and most if not all numbers should be rounded. 1975 values are historical. The numbers do not reflect possible adjustments that might result from potential water rights disputes. (Deficits shown for 1975 do not reflect actual surface deliveries that year for Cachuma Project members.)

** Goleta Basin and Ellwood to Gaviota should be considered jointly, as some of the water demand in Ellwood to Gaviota is being satisfied by export of water from Goleta Basin area. Also, the Cachuma supply values to Goleta Basin do not allow for water available for purchase by Goleta CWD from other Member Units, as has occurred normally in past years.

*** Santa Ynez Riparian Basins (alluvial gravel basins, Bradbury Dam to Lompoc Narrows) are recharged by releases and spills from Cachuma Reservoir and local tributary inflows. In general, releases from Cachuma must maintain adequate riparian basin recharge, and thus, there is no surplus or deficit in these basins.

**** Cuyama Basin groundwater is essentially the sole source of supply for Cuyama Valley. Due to continuing depletions and increasing pumping costs, the projections are for an eventual decline in irrigated agriculture in this area. No major water resources developments are yet planned for Cuyama Valley.

TABLE 8

PERCENTAGE OF TOTAL WATER SAVINGS BY AREA

Area	1980	1990	2000
Carpinteria	15-25%	15-26%	17-28%
Montecito	9-24%	10-26%	13-28%
Summerland	11-26%	12-29%	10-29%
City of Santa Barbara	13-30%	13-31%	14-34%
Goleta	9-24%	13-27%	15-29%
Santa Ynez Valley	12-25%	13-27%	14-28%
Lompoc	12-28%	14-29%	15-30%
Los Alamos	12-27%	14-31%	15-34%
City of Santa Maria	16-30%	17-31%	18-33%
Orcutt	12-33%	14-36%	16-39%
Lake Marie	11-22%	12-23%	14-29%
Guadalupe	13-27%	16-30%	16-30%
Sisquoc	11-24%	11-24%	11-24%
Cuyama	9-23%	9-23%	9-23%
Average	12-26%	13-28%	14-30%

Source: SBCWA, Present and Future Water Needs, January 13, 1978.

ALTERNATE SOURCES OF SUPPLEMENTAL WATER SUPPLY*

The Water Agency has investigated a number of alternatives for water resources development in its Program of Action for Water Resources Planning. The alternatives, which are described in the Water Agency reports with regard to cost, flexibility, reliability, potential environmental impacts, water quality effects, and general project financing feasibility, include:

1. importation of State Project water via San Luis Obispo County (Coastal Aqueduct);
2. importation of State Project water via Ventura County (to South Coast area);
3. increased conservation of surface water by construction of new dams, reservoirs and spreading grounds;
4. desalination of seawater, oil field brines, wastewater or agricultural tailwater;
5. reclamation and reuse of wastewater;
6. weather modification through cloud seeding;
7. conjunctive use of surface and groundwater supplies;
8. watershed management;
9. construction of infiltration tunnels within the Santa Ynez Mountains;
10. mining of groundwater; and
11. increased consumer conservation.

The yields and water costs of these alternatives are tabulated for each major area of the County in Tables 9 — 12. These are preliminary figures and subject to further study by the Water Agency. Only projects which would yield "new" water (i.e., water not previously counted as existing available supply) are considered. These regional water supply alternatives could be combined in a number of ways to meet future County-wide supplemental water needs.

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* Source: Santa Barbara County Water Agency, Adequacy and Ecomonics of Water Resources Development Alternatives, March 13, 1978.

TABLE 9: SOUTH COAST AREA ALTERNATIVES

Alternative	Yield (AFY)[b]	Cost ($/AF)[c]
Urban Conservation	7,060	2
Weather Modification	2,740	9
Conjunctive Use (NRS)	2,600	11
Wastewater Reclamation	9,350	$\leq$ 540
Enlarged Cachuma	10,000	510
Desalination (wastewater)	12,330	$\leq$ 570
SWP (Coastal Branch)	10,800	528
SWP (Ventura Route)	10,800	366[a]
Dam Projects	8,410	1,510
Conjunctive Use (Integrated)	2,800	920
Watershed Management	1,200	385

a/ Includes a pipeline from Cachuma to Lompoc.

b/ Yields do not include returns to the groundwater bains.

c/ Unit costs are presented in terms of end of 1978 dollars excluding financing and buildup considerations (ENRCCI 2890).

Source: SBCWA, Adequacy and Economics, March 13, 1978.

TABLE 10: SANTA YNEZ VALLEY ALTERNATIVES

Alternative	Yield (AFY)	Cost ($/AF)
Weather Modification	4,700	9
Conservation	650	2
Conjunctive Use (NRS)	300	11
Cachuma Enlargement	4,000	510
State Water (Coastal Branch)	2,600	498
State Water (Ventura Route)	2,600	366
Conjunctive Use (Integrated)	4,300	920
Watershed Management	240	≤ 385

See Note "C", page 60

Source: SBCWA, Adequacy and Economics, March 13, 1978.

TABLE 11: LOMPOC-SAN ANTONIO AREA ALTERNATIVES

Alternative	Yield (AFY)	Cost ($/AF)
Weather Modification	5,000	9
Conservation	1,140	2
Spreading Grounds	2,000	5
Salsipuedes Project	6,500	301
State Water Project (Coastal Branch)	9,100	486
State Water (Ventura Route)	9,100	366
Cachuma Enlargement	6,000	510
Wastewater Reclamation	2,200	215
Desalination (wastewater)	2,000	320
Desalination of Oil Brines	1,700	625
Watershed Management	800	≤ 385

See Note "C", page 60

Source: SBCWA, Adequacy and Economics, March 13, 1978.

TABLE 12: SANTA MARIA-ORCUTT AREA ALTERNATIVES

Alternative	Yield (AFY)	Cost ($/AF)
Twitchell Management	1,500	~0
Increased Conservation	3,310	2
Weather Modification	13,000	9
Spreading Grounds	3,500	32
State Water	10,000	306
Round Corral Dam	6,700	762
Watershed Management	4,650	≤ 385
Desalination of Agricultural Tailwater	2,400	625
Desalination of Oil Brines	2,400	820

See Note "C", page 60

Source: SBCWA, Adequacy and Economics, March 13, 1978

Draft Table 13 is obsolete. Individual alternatives as shown in Tables 9-12 may be combined in a number of different ways depending upon future levels of demand. See Jones and Stokes Environmental and Water Resources Reconnaissance Report (January 1979) or the Water Agency's Adequacy and Economics Report, March 13, 1978, for illustrative combination alternatives.

WASTEWATER

Table 14, from the Area Planning Council's Draft Areawide Land Use Element for Santa Barbara County (January 1978), lists present flows and current design capacities of wastewater treatment facilities in the County. Most areas have more than 30% capacity remaining. However, in order to comply with water quality objectives, some districts may have to upgrade their treatment capacities. In some cases, this may require using some of the remaining capacity. For example, the Goleta Sanitary District has been ordered by the Regional Water Quality Control Board to upgrade their facility from primary to secondary treatment. The Goleta County Sanitary District is currently appealing this order. The 14 mgd figure is based on primary treatment rating. Upgrading the plant to secondary treatment would reduce the capacity to 7.6 mgd.

The State Water Resources Control Board has established a priority funding list of projects to clean up California waters. Ten communities in Santa Barbara County are listed for sewage treatment projects totaling nearly $55 million. The priority list does not guarantee State funding, but enables the sanitary and water districts to compete for limited available funds. The projects include the following:

1. Carpinteria Sanitary District, $2 million to improve sewage treatment and disposal system, starting in 1979-80.

2. Summerland Sanitary District, $530,000 to improve sewage treatment and disposal system, starting in 1978-79.

3. Montecito Water District, $3 million for wastewater reclamation projects, starting after 1983; Montecito Sanitary District, $1 million to increase sewage treatment plant capacity.

4. City of Santa Barbara, $2.5 million, with $1.8 million for the wastewater reclamation project now completed, and $650,000 for renovation or replacement of the airport sewer system.

5. Goleta Water District, $17.7 million beginning in 1978-80 for project to use wastewater for landscaping and agricultural irrigation. Goleta Sanitary District, $15.7 million for upgrading its wastewater treatment to secondary processing.

6. Santa Ynez Community Services District, $2.2 million to continue work on sewage collection system and an interceptor to the Solvang Municipal Improvement District (SMID). $1.1 million for SMID to complete interceptor and treatment plant expansion project.

7. Buellton Community Services District, $670,000 for correcting treatment system deficiencies.

8. Lompoc, $2.2 million to continue its interceptor project to eliminate wet weather discharges.

9. Mission Hills, $2.5 million for interceptor, starting during 1980-81.

10. Santa Maria, $5.65 million to increase disposal system capacity, a project already in process.

WASTEWATER TREATMENT FACILITIES (1978)

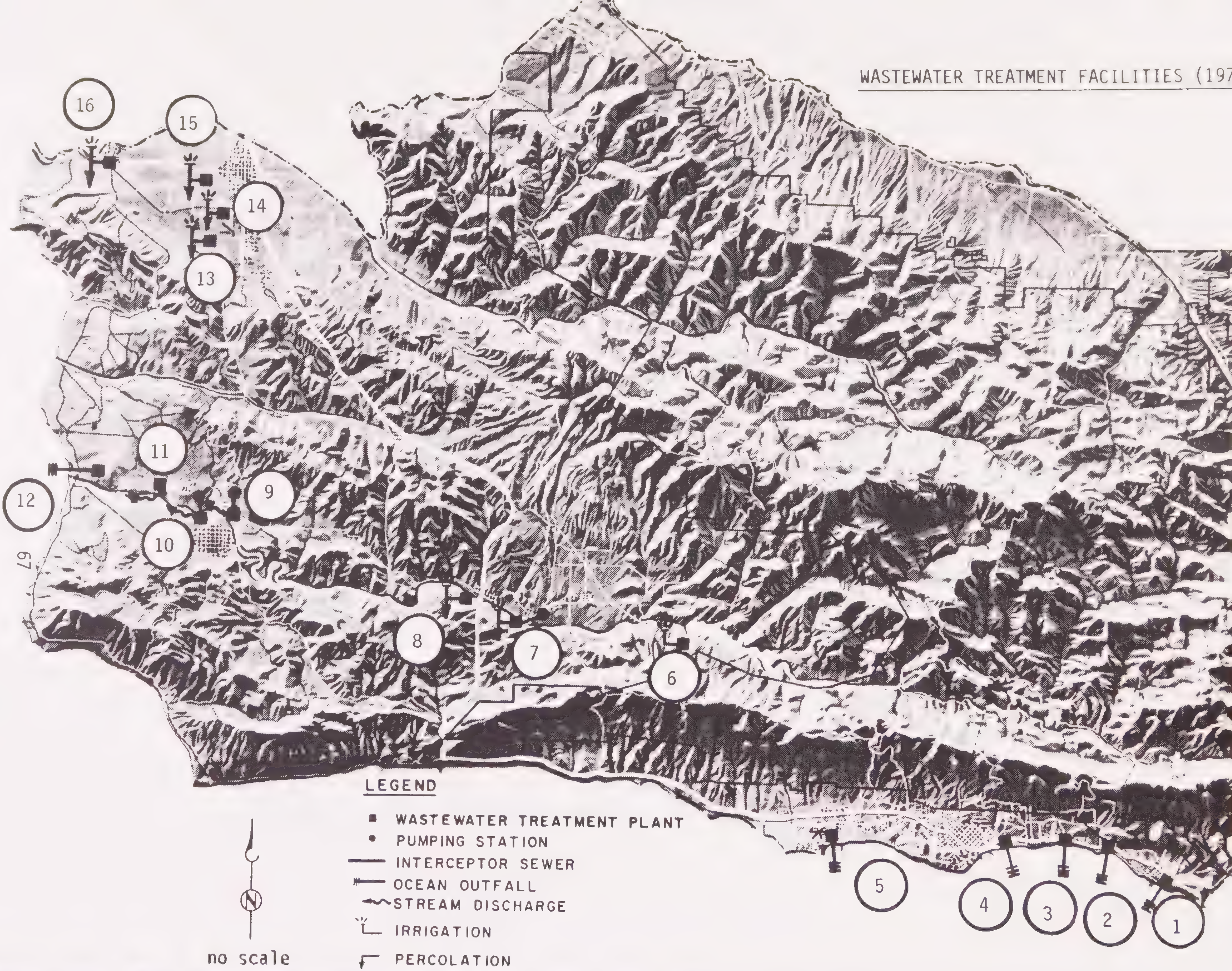


TABLE 14

WASTEWATER FLOW AND SEWERAGE CAPACITIES

Area or Jurisdiction	Design Capacity Flow (mgd)	Current Wastewater Flow (mgd)	Estimated Remaining Capacity Percent	Estimated Total Population Capacity of System*
(1) Carpinteria Sanitary District[a]	2.0	1.1	33.0%	17,500
(2) Summerland Sanitary District[a]	.15	.115	23.0%	318
(3) Montecito Sanitary District[a]	.75	.7	7.0%	8,896
(4) Santa Barbara City Water[c] Treatment Plant	11.0 New Plant	At Capacity	-----	104,000 New Plant
(5) Goleta Sanitary District[a] including Isla Vista Sanitary District, UCSB, and Santa Barbara Airport	8.0	6.23	22.0%	136,570
(6) Cachuma County Sanitary District[b,f]	.22	.04	82.0%	N.A.
(7) Solvang Municipal Improvement District[i]	.80 (ADWF)**	.38	52.0%	N.A.
(8) Buellton County Sanitary District[i]	.3	.21	70.0%	4,500[h]
(9) Mission Hills[f]	N.A.	.19	N.A.	N.A.

* Some figures may not take into account the number of persons serviced by private septic tanks or other private sewage services.

** ADWF--Average Dry Weather Flow

WASTEWATER FLOW AND SEWERAGE CAPACITIES (continued)

Area or Jurisdiction	Design Capacity Flow (mgd)	Current Wastewater Flow (mgd)	Estimated Remaining Capacity Percent	Estimated Total Population Capacity of System*
(10) City of Lompoc[e,f] including Vandenberg Village	5.0	2.5	56.0%	69,860[h]
(11) Federal Correction Institution	.3	.17	43.0%	2,350
(12) VAFB (Main)[b,e,f]	3.0	1.2	60.0%	30,000
VAFB (South)[b,e,f]	.11	.04	63.0%	1,900
(13) Laguna County Sanitary District	2.4 (ADWF)	1.52	37.0%	31,000
(14) Santa Maria Airport Water[b,d,f] Treatment Plant	.75	.37	51.0%	N.A.
(15) Santa Maria City Water[b,f,g] Treatment Plant	5.5	5.0	.5/2.8 (in 1981)	N.A.
(16) Guadalupe Water Treatment Plant[b,f**]	.5	.5	0%	N.A.

* Some figures may not take into account the number of persons serviced by private septic tanks or other private sewage services.

** On April 14, 1978, the state Regional Water Quality Control Board, Central Coast, issued a cease and desist order (#78-03) because the Guadalupe Water Treatment Plant was violating adopted waste discharge requirements. As a result, additional discharges to the sewer system of this area have been prohibited.

Notes to Table 14:

a. Service System Capacity Studies Preliminary Data, prepared by the Joint County of Santa Barbara--City of Carpinteria Local Coastal Program Staff, November 1, 1977, pp. 27 (Carpinteria), 19 (Summerland), 14 (Montecito), 7 (Goleta).

b. Water Quality Control Plan Report Central Coastal Basin Part II, State Water Resources Control Board, April, 1975, pp. 16-103 (Federal Corrections Institution and VAFB), 16-115 (Solvang), 16-114 (Buellton), 16-115 (Cachuma), 16-90 (City of Santa Maria), 16-91 (Santa Maria Airport and Laguna), 16-88 (Guadalupe).

c. City of Santa Barbara, 1977, as cited in Effects of Rezoning the City of Santa Barbara: Draft Economic and Social Report, prepared by Hennison, Durham, and Richardon, Ecosciences Division, Santa Barbara, California, June 15, 1977, pp. 2-92, 2-93.

d. Santa Barbara County Department of Public Works, 1975, and letter of 5/17/78.

e. Lompoc Department of Public Works, 1975.

f. Figures for current wastewater flow (Lompoc through Guadalupe) are from the individual service districts as compiled by the Santa Barbara County Water Agency.

g. City of Santa Maria, Department of Public Works, May 10, 1978.

h. This estimate was calculated by dividing the existing population by the percent amount of sewage capacity being expended.
Because of the limited accuracy of this method, it was employed only where specific figures for total population capacity could not be found.

i. Personal conversation, January, 1978. Central Coastal Basin, California, Regional Water Quality Control Board, San Luis Obispo, California.

CONCLUSIONS AND RECOMMENDATIONS

The complex issues of water supply alternatives and distribution should be evaluated within the authority and expertise of the Santa Barbara County Water Agency and its Board of Directors. Obviously, the land use recommendations of the Comprehensive Plan will affect future water demand and must be taken into consideration in any supplemental water supply decision. The final determination rests with the voters of Santa Barbara County, and ultimately with the Board of Supervisors. The Conservation Element will be updated as necessary to reflect current water resources conditions.

The County's and the cities' decisions on land use and development projects should be based on the following water resources policies:

- The County and the cities should support the Regional Water Quality Control Board in its establishment of discharge requirements for point source waste discharges, in order to protect surface and groundwater supplies.

- Use of streams from which groundwater recharge takes place should be regulated to ensure that the recharge capability of the channels is not impaired.

- Land use and development upstream from surface reservoirs should be regulated and monitored by the County Department of Public Works and the County Planning Department in order to minimize the production of water polluting wastes.

- The County should initiate a study of land development in areas relying on septic tanks to assess the impact of alternate densities on water quality.

- On the basis of the adopted Water Quality Control Plan for the Central Coastal Region, the County and the cities should review their policies for protection of local water resources to determine what changes may be necessary.

Ecological Systems

INTRODUCTION

In developing recommendations on the environmental biology of Santa Barbara County for the Conservation Element, we have done two different things. First, we have described the ecological communities as they exist, and while there may be minor questions of the exact location of some species, this part of the process is straightforward. Second, we have made decisions that lead to recommendations on how each piece of land should be used in the future. This step clearly required us to make judgments, and these reflect our personal knowledge and biases. It is important, therefore, that we state what our biases are and how we made the judgments.

As biologists and ecologists we are convinced that a major effort should be made to preserve as much biological diversity as possible, and our reasons for this conviction are presented in the next section. In particular, Santa Barbara County is a unique ecological oasis along a coast that is rapidly becoming a megalopolis. Happily, Santa Barbara County is well endowed with a diversity of ecological communities; for example, it contains at least small patches of half of the plant communities found in California (Munz, 1970). Furthermore, its peculiar history and the environmental awareness of its citizens make it far more likely than other areas to succeed in preserving this large range of communities. In our judgment, therefore, the ecological goal for the County is simple: we hope that wise planning can ensure that in 50 or 100 years the natural (and semi-natural) environments of the County will look much as they do today.

The major process affecting that goal is land use. Lee M. Talbot, of the National Council on Environmental Quality, noted (Haskins, 1974) that, in spite of the great concern over pollution, as far as preserving diversity is concerned, pollution "is about the least important aspect of environment" — because it is often reversible. But changing land use, he noted, can eradicate habitats and exterminate species. Pollution also is a great simplifier, but its effects are hard to control. By contrast, the effects of land use are usually obvious, and therefore we can more easily make wise decisions.

In the remainder of this chapter we present our reasons for preserving diversity in Santa Barbara County and some simple general rules for choosing natural communities to protect. We then explain how we mapped each type of community, and how we used the available infor-

mation about the community (its rareness, usefulness for scientific study, the degree to which it is endangered, and so on) to reach a recommendation on its future use. These recommendations are summarized on the Environmental Biology maps.

PRESERVATION OF BIOLOGICAL DIVERSITY: THEORY AND RULES

We present here (1) the reasons why natural and semi-natural biological communities should be preserved; (2) the basic ecological considerations that determined how we chose particular areas for protection; and (3) a set of simple rules that guided the way we mapped our chosen sites.

Preserving Natural Systems

We present below some reasons for preserving species, a need that is recognized already by the State in its laws on rare and endangered species, and on conservation and open space planning. But first we must stress a fundamental point: to preserve species in nature we need to preserve whole biological communities and the environment in which they live, that is we need to preserve ecosystems. For example, raptorial birds need small mammals or small birds as food, and they in turn need a variety of seeds and insects, and they in turn require a variety of plant species. The birds may need one kind of habitat to nest in and another to feed in and these may need to be close together, while the insects have different things they eat at different times of their lives. Furthermore, it is extremely unlikely that we can preserve solely the web of species that directly supports the bird and its prey species. Since we usually cannot predict the consequences of major changes in a community, we usually have to preserve it as it comes — with perhaps some management. So, the preservation of biological diversity becomes the preservation of ecosystems.

Why should we make the effort to preserve the species that now exist? After all, millions of species have become extinct through geological time, and in our own history we have accounted for thousands. In the last 3 centuries we have driven extinct about 100 bird species and over 50 species of mammals (perhaps as many as 80). Furthermore, the rate of extinction is accelerating alarmingly: 25 of the 47 species of wildlife lost in the U.S. in the past 270 years became extinct in the last 50 years. In spite of all this, we seem to be surviving pretty well; it seems as if we didn't need the Dodo anyway. Couldn't we do

just as well without the Condor, Bald Eagle, and numerous other species that live in natural communities? The answer undoubtedly is that we certainly could survive pretty well without some of them, but it is not clear what the minimum number is that constitutes a viable biosphere, or which species they are; and, more difficult, it is not clear which species are now or might someday be useful, or which species are a necessary part of an ecosystem that contains species that someday might be useful. Each species gone is an option foreclosed, and it is impossible for us to tell which options the human race might someday want to take up. Thus, the conservative procedure is to preserve as many different types of ecosystems as we can, in each case preserving at least the minimum number of areas that is necessary for the community to maintain itself indefinitely. Since we know so little about the factors that are important in determining the long-term survival of ecosystems, we have to make generous estimates of the minimum needed.

Estuaries on the California coast provide an example of rare ecosystems that probably are dangerously close to the minimum. These are few and far apart, and, except for a very few, they are small. Yet, they are extremely important in supporting a large number of bird species, many of which migrate along the coast. Furthermore, the organisms in the estuaries cast their young into the ocean and "seed" other estuaries, so that estuaries depend upon other estuaries for recruitment. As estuaries become fewer and smaller, we run the risk of losing not only bird species but resident estuarine species also.

There are at least five reasons for preserving natural communities and as much genetic diversity as possible. First, many natural ecosystems are of obvious direct benefit. For example, forests on hills and along stream and river courses protect the soil from erosion, trap rain, and slow its runoff rate, thus facilitating recharge of groundwater basins. Forests lower wind speed and water movement, thus slowing erosion on adjacent agricultural lands. Trees and other vegetation in agricultural areas serve the same purpose. Forests (and other dense vegetation) also cause the local climate to be wetter, and their removal in semi-arid areas, such as the northern shore of the Mediterranean (whose climate is like Santa Barbara's), has caused deserts to be created in formerly agricultural areas. Many natural systems also directly provide food, game, fisheries, and wildlife. Estuaries are extremely important as "nurseries" for many species of fish and for the prey species that the fish depend on. Perhaps as much as 30 per cent of the world fish catch is dependent in some way on estuarine waters, and this percentage is at least twice as high in

the United States. Inshore ocean communities themselves are the world's major source of fish protein. The significance of these ecosystems is enhanced because the seashore, and estuaries in particular, are precisely the regions that have the fastest growing populations and that attract industry. Thus, estuaries not only are exceptionally useful natural areas to man, they also are under the greatest pressure from development and are "sinks" for man's pollutants.

Second, unmanaged communities serve a number of indirect functions through which they aid crop systems, the two obvious functions being pollination and the maintenance of a store of natural enemies for pest control. More than half of our crops are pollinated by insects — a service we generally get free. It is true that for some crops we could, and sometimes do, transport honey bees to the fields to help pollination. But this cannot be done with all crops, it is an extra cost, and it would be dangerous to depend completely on our ability to maintain this substitute in the indefinite future. The problem of providing substitutes for natural enemies that move back and forth between crops and wild vegetation is even more complicated and fraught with difficulties, as the history of pesticides has illustrated.

Third, natural communities are a storehouse of genetic information. Each species is a unique experiment which we can never repeat once the species becomes extinct. It is impossible to predict where and for what reason we might want to go to the storehouse — for new crops for food or fiber, for natural enemies, to purify an organic molecule so that we can make its analogue, and so on.

Fourth, we need natural systems as outdoor ecological laboratories. How is it that natural systems are self-maintaining and relatively stable? What determines where species occur and which species occur together? How do predators operate in nature, and can we get ideas from natural systems to use in crop systems? These are just some of the questions we need to ask of natural systems.

Finally, but just as important, a large fraction of our population derives enjoyment from light, non-destructive, recreational use of natural and semi-natural areas, and this is particularly true in Santa Barbara County. Furthermore, as we become more affluent, we can expect this kind of use to grow. This is illustrated by the fact that recently the number of visits paid to National Parks has been increasing at 10 per cent per year (doubling every 7 years) while the U.S.

population has been increasing at only 1 per cent (doubling only every 70 years). Thus, areas we set aside now must be large enough and numerous enough to survive the increased use that inevitably will be made of them in the near future.

Some Considerations Governing Classification of Areas

Although natural communities are generally self-maintained and, therefore, in a sense come "free", it is not true that any randomly chosen part of an ecosystem will survive. To ensure the survival of a given type of ecosystem we have to be concerned with several sorts of problems, discussed below.

Extinction of Populations — The likelihood that a population will go extinct from "chance" events increases as the population gets smaller. Thus, there is a minimum population size below which a species very probably will become extinct. Species with very low birth rates, like the California Condor, are particularly vulnerable because they take a long time to recover from adverse conditions. Small areas that support smaller populations can maintain fewer species than larger equivalent areas. This is illustrated by the fact that fewer species of birds are found on the smaller Channel Islands than on the larger ones and also that the local extinction rate over the past 50 years has been greater on the smaller islands (Diamond, 1969). Small areas support only small populations which can become extinct by accident during occasional storms, fires, etc. Furthermore, some species naturally are rare, for example large animals or those specialized to certain habitats or kinds of foods, and these are usually the first to go extinct on islands.

A nature preserve is destined to become an island in a sea of habitats modified by man. It will lose species as does any other island; and the smaller it is, the faster will it lose them.

Recolonization — Although some populations may go extinct locally, all species have dispersal stages; and, provided other areas in the region contain the species, the local population can be reconstituted by colonists from nearby populations. The evidence from islands again is instructive. The further away islands are from the mainland, the fewer species they have (other factors, such as island size, being equal). For example, one small island isolated during the building of the Panama Canal has lost about one species of bird per year for the past 50 years.

Clearly, then, we must try to ensure, first, that we preserve several examples of each ecosystem so that the inevitable attrition of species in each area can be balanced by recolonization, and second, that the areas are close enough together to allow some individuals to migrate between areas.

Simplification — All ecosystems are "open" systems in that they receive materials from other areas. No matter how isolated an area is or how careful we are, we will have some effect on it. The history of environmental problems is replete with examples of ecosystems being damaged by seemingly unrelated activities in distant ecosystems. The effects of air pollution in Los Angeles on surrounding agriculture and forests, the movement of pesticides about the earth, the effects of irrigation, the effects of removing upstream groundcover, and the effects of applying fertilizers on water quality elsewhere are among the more notable examples.

We need to be concerned about the cumulative effect of a variety of pollutants on natural ecosystems because all types of pollutants, especially herbicides, radiation, and air pollution, have a uniform effect on communities; they simplify them by selectively killing species that are "non-weedy" and have poor dispersal powers (Woodwell, 1970). Thus, inevitably we will gradually and inadvertently simplify the communities around us, thereby reducing their ability to maintain themselves. The "openness" of ecosystems requires that we surround preserved ecosystems with buffer zones where heavily polluting or disrupting activities are prohibited, and that we also make the areas large enough to withstand inevitable accidental effects from elsewhere in the County. Furthermore, because various harmful materials may penetrate the preserve from outside, and because harmful activities may occur at the edge of the preserve, an optimum shape for a preserve will minimize the length of the edge in relation to total area; so a circular preserve is preferable to a long narrow preserve.

Future Use — Because people's use of natural areas grows more rapidly than does population, we must plan for much heavier use than occurs now. A doubling or tripling of the amount of use in the next decade is not unlikely. Therefore, we need to be generous in our estimates of areas that should be set aside for light recreation.

Some Simple Guiding Rules — Based on these considerations, we have prescribed some rules for designating natural preserves and other lightly used areas to minimize deleterious environmental effects

occurring both naturally and through man's activities. These rules governing the size, shape, and number of such areas, seem to us only common sense (see Wilson and Willis, 1974). However, the rules provide no magic formula for choosing areas of the right size, shape, or number. Clearly, the minimum size needed to preserve a Condor population is much larger than that needed to protect some lizard species. We cannot calculate the appropriate size for all species or ecosystems. nor do we know precisely how close similar preserves ought to be to ensure recolonization. We have relied on our general knowledge of the natural history of the County's flora and fauna in making these decisions; and, of course, in many instances we simply have had to accept what few ecosystems of a given type are available.

Briefly, the rules are these.

— Individual preserves must be made as large as possible to minimize the extinction rate of particularly vulnerable species having low birth rates, such as birds and mammals.

— To minimize the amount of edge in relation to area, preserves should be kept as round in shape as possible.

— Preserves should be clustered as near each other as possible so that if a species goes extinct in one, the chances of recolonization from a neighboring preserve are maximized.

— Where possible, preserves should be surrounded by buffer zones in which only light recreation activities are permitted.

METHODS OF MAPPING AND EVALUATING ECOLOGICAL UNITS

Suppose one looks at the Environmental Biology maps (on file in the County Planning Department) and wants to find out what environmental value a particular place has, what use it can tolerate, and why. The map of the County has been divided into "ecological units". Each unit represents an area supporting a single type of natural ecological community of plants and animals such as coastal sagebrush, native grassland, live oak woodland, marine rocky intertidal zone, etc.

Within the mapped area of each ecological unit is a set of four code numbers representing (1) the particular category of natural community, (2) the ecological value of that community, (3) the use which it

can tolerate, and (4) the intensity of that use which it can tolerate. The list of categories, values, uses, and intensities are given in Table 1 . For example, the salt marsh at the mouth of the Santa Ynez River at Surf is designated as 34-1-2-2. The first number (34) indicates that it is a salt marsh, the second (1) indicates that its ecological value is an unusual and delicate habitat with several endangered species and consequently of scientific value. The third and fourth digits (2-2) indicate that it can tolerate recreation of a very light intensity, such as photography or bird watching.

TABLE 1. CLASSIFICATION SYSTEM FOR ENVIRONMENTAL BIOLOGY

1. Categories, County-wide Maps

    1. Exposed and protected coastal rocks
    2. Sandy beaches and coastal dunes
    3. Sloughs, closed bays, pilings, and coastal salt marshes
    4. Chaparral and scrub habitats
    5. Grassland
    6. Woodland and savanna
    7. Forest habitats
    8. Riparian forests and riparian woodlands
    9. Swampy habitats and aquatic habitats
    10. Introduced trees and shrubs
    11. Non-irrigated crops
    12. Irrigated row crops
    13. Orchard or vineyard
    14. Urban

2. Categories, Study Area Maps

    A. Coastal strand and marine habitats

        10.-Exposed rocks, bluff tops
        11. Exposed rocks, supratidal splash zone
        12. Exposed rocks, intertidal
        13. Exposed rocks, subtidal

        15. Protected rocks, bluff tops
        16. Protected rocks, supratidal splash zone
        17. Protected rocks, intertidal
        18. Protected rocks, subtidal
        19. Pilings, wharves, and breakwaters

20. Coastal dunes
21. Sandy beaches, supratidal splash zone
22. Sandy beaches, intertidal
23. Sandy beaches, subtidal

30. Dunes in sloughs or closed bays
31. Sloughs and closed bays, supratidal
32. Sloughs and closed bays, intertidal
33. Sloughs and closed bays, subtidal
34. Sloughs and closed bays, from the supratidal marsh to the subtidal

B. Chaparral and scrub habitats

40. Coastal Sage ("soft" chaparral)
41. Great Basin Sage
42. Alkali Sink
43. Chamise Chaparral
44. Mixed Chaparral
45. Deciduous Oak Chaparral
46. Serpentine Chaparral associations
47. Semi-desert Chaparral
48. Montane Chaparral
49. Channel Islands Chaparral

C. Grassland

50. Native grasslands (usually remnants)
51. Introduced grasses
52. High altitude grassland — Portrero

D. Woodland and savanna

60. Central Oak woodland
61. Southern Oak woodland
62. Pinyon Juniper woodland
63. Channel Islands woodlands
64. Foothill woodland

E. Forest habitats

65. Canyon Oak-Bigcone Spruce

66. Coast Live Oak
67. Interior Cypress
68. Torrey Pine forest
69. Mixed Evergreen
70. Coastal Pine
71. Douglas Fir
72. Mixed Conifer
73. Jeffrey Pine
74. Coulter Pine forest or woodland

F. Riparian forests and riparian woodlands

75. Lowland riparian woodland

G. Urban, cultivated, and exotics (introduced trees and shrubs)

76. Introduced trees and shrubs
77. Urban and/or cultivated

H. "Swampy" habitats

80. Fresh-water marsh

I. Aquatic habitats

90. Streams, small intermittent
91. Streams, large intermittent
92. Streams, permanent
95. Standing waters, eutrophic
96. Standing waters, mesotrophic
97. Standing waters, vernal pools (coastal valley)

J. Miscellaneous

98. Fossil deposits
99. Prehistoric and archaeological sites

3. <u>Value Classification (in order of importance)</u>

1. Unusual or delicate habitats, endangered species, and scientific study area

2. Unusual or delicate habitats and endangered species
3. Endangered species and scientific study area
4. Endangered species
5. Unusual or delicate habitat and scientific study area
6. Unusual or delicate habitats
7. Scientific study area
8. None of the above

4. Tolerance to Other Uses (in order of importance)

    1. Only regulated scientific study
    2. Recreation alone
    3. Managed production of commercial biological resources alone
    4. Managed production and recreation
    5. Agriculture alone
    6. Agriculture and managed production
    7. Agriculture, managed production, and recreation
    8. Urban development
    9. Urban development and recreation

5. Intensity of use

    1. Only regulated scientific study
    2. Very light (observation of animals and plants, sketching, photography, etc.)
    3. Light (hiking, backpack camping, line fishing, bicycling, education programs without collecting, low density informal picnicking without tables or cooking facilities)
    4. Moderate (spear fishing, hunting, picnicking with tables and fire pits, informal ball games without permanent fixtures, horseback riding, low density, easy access camping with water and sanitary facilities but no electrical outlets and less than 5 sites/acre, light geologic or biologic specimen collecting by amateurs)
    5. Heavy (trail bikes, dune buggies, high density group picnic areas with shelters, fire pits and tables, high density auto access camping areas with electricity, water, sanitary facilities and 6 to 20 sites/acre, recreation uses with permanent facilities)

In the following sections, we explain how we arrived at the mapping and coding system, how we decided to map what we did, and how we arrived at value, tolerance, and intensity levels for mapped areas, habitats, and communities.

Categories

Because one of the best ways that a biologist can classify geographic areas is on the basis of their vegetation, we have decided to use plant communities as the major map category. Of the 29 California plant communities Munz (1971) describes, more than half can be found in Santa Barbara County. For purposes of accuracy and to maintain the potential for adequate description, we have subdivided these 15 communities into a somewhat larger, more descriptive, and more complete list.

Since the distribution of animal species usually conforms with the distribution of the particular plant communities in which they live, maps of animal and plant communities often coincide. The White-tailed Kite, for example, prefers as prey California Meadow Mice, which inhabit grassland. Where we wished to call attention to the kites, therefore, we mapped two areas of grassland, one with kites and one without.

Rare or endangered species also were mapped on the basis of plant communities. Certain birds (Black and Clapper Rails) are restricted to salt marshes, for example, and it is extremely unlikely that one could find them anywhere else. Similarly, certain plants (e.g. *Cirsium rhothophilum*) are restricted to coastal dune habitats. However, other rare or endangered species such as the California Condor, are not restricted to a single plant community. To map these species, we determined the area of the organism's most intensive use, or likely distribution.

When the animal species' distribution does not conform exactly with mapped plant communities these plant communities were sub-divided. Then different parts of the same plant community received different "values", "tolerances", and "intensities" (see below). Similarly, we sometimes sub-divided plant communities and gave the different parts different values for other reasons, such as the presence of a stream in one section.

Biological Values

Values such as "rare and endangered species" and "unusual or delicate habitats" provided the biological criteria for assigning tolerance and intensity levels. Of prime importance here was the degree to which species or communities are rare in Santa Barbara County.

In general, biologists place highest environmental priorities on areas, regardless of apparent scenic value, approximately in their natural condition, undisturbed by European man. Even though no pure examples can be found in the County, numerous areas exist where this disturbance has been light, or where there is little or no disturbance at present, as in portions of Vandenberg Air Base and the Channel Islands. Undisturbed areas not only support "natural" biotas but, at the same time, may serve as "refuges" for organisms that are uncommon or rare elsewhere. Thus, Bald Eagles, which formerly nested in several places along the South Coast, now only winter in the extreme eastern, undisturbed portion of Lake Cachuma.

We also are extremely concerned about preserving some examples of all of the biotic communities found in the County. Where communities, like mixed coniferous woodland, are very rare and thus represent a very small portion of the County, most localities were mapped. However, for abundantly represented communities, such as chaparral, only prime examples or remote, undisturbed patches were recommended for preservation. It should be obvious, however, that we cannot be certain that our mapping is all-inclusive, especially in instances where the exact location of a community is unknown.

Several communities are quite rare in the County, but this does not necessarily connote rareness throughout the State. Perhaps our rarest community, the Douglas Fir forest (we have only one extremely tiny stand), actually is one of the most abundant coniferous trees in the Pacific Northwest. Similarly, mixed coniferous forest, mixed evergreen woodland, Great Basin sagebrush, and interior cypress forest, all rare communities in the County, are moderately abundant and widely distributed in the northern part of the State. On the other hand, Bishop Pine forest (a representative of closed-cone pine forest), coastal salt marsh, coastal dune, and vernal pools are all uncommon or rare, regardless of where one looks.

We have approached this "relative rareness" problem with the belief

that Santa Barbara County should be regarded as a discrete entity. If a community is common in other parts of the State but uncommon in the County, then we have regarded it as an "unusual habitat". This approach will maximize and maintain the biotic diversity of the County. In a few instances, locations were mapped for less well defined biological reasons. The lower reaches of Happy Canyon, for example, are of extreme scenic value (a subjective feeling), because of an abundant spring wildflower display.

Tolerance to Use

The statement that some biotic communities are more tolerant of disturbance than are others may seem obvious; yet historically the treatment received by natural communities in national, state, and regional parks and preserves indicates that many people do not understand this fact. Mixed chaparral is extremely tolerant to disturbance. This community can and should be completely burned, yet will recover in a relatively short time. Moderately heavy hiking does not harm it extensively, and very thick chaparral is essentially impenetrable. On the other hand, certain plant communities are so sensitive to disturbance that they have almost completely disappeared. Native grassland, for example, is almost non-existent in the State because grazing, heavy traffic, and competition with introduced grasses essentially have eliminated it. The coastal strand and dune community is another example of an extremely delicate community. Highly specialized organisms live in this unstable, "oozing" substrate. Traffic damages vegetation, thus accelerating sand movement and making seed germination an uncommon event. Without roots in the sand, mammals cannot maintain their burrows.

Intensity of Use

Stating whether a community was tolerant or intolerant to a particular use does not convey enough information because a community tolerance varies with the specific type and intensity of use. A Douglas Fir forest, for example, normally should be moderately tolerant of traffic. The tiny Purisima Hills stand, however, is on a rather steep slope; and traffic would promote erosion, thus further threatening the trees.

Recreation can be conducted at varying degrees of intensity. Wildlife watching, photography, and hiking can be done almost

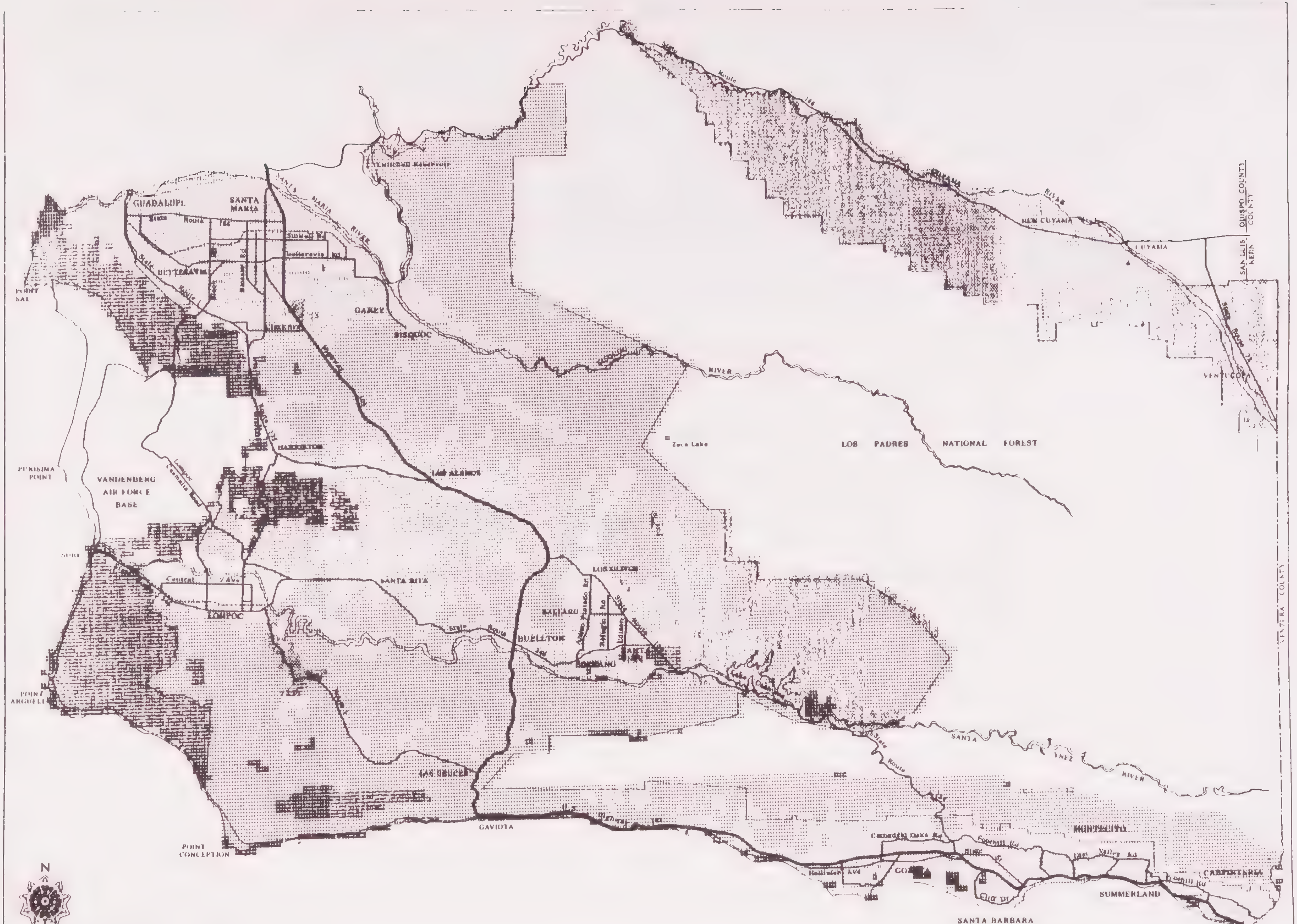
Santa Barbara County Environmental Biology: Value Classification

- Unusual or Delicate Habitat, Endangered Species, and Scientific Study Area (1)
- Unusual or Delicate Habitat and Endangered Species (2)
- Endangered Species and Scientific Study Area (3)
- Endangered Species (4)
- Unusual or Delicate Habitat and Scientific Study Area (5)
- Unusual or Delicate Habitat (6)
- Scientific Study Area (7)


Twitchell Reservoir
SANTA MARIA RIVER
GUADALUPE
SANTA MARIA
State Route 166
Stowell Rd
Betteravia Rd
BETTERAVIA
Black Rd
Blosser Rd
Route 1
Clark Ave
GAREY
SISQUOC
SISQUOC RIVER
Route 135
Zaca Lake
LOS PADRES NATIONAL FOREST
NEW CUYAMA
CUYAMA
RIVER
State Route 166
SAN LUIS OBISPO COUNTY
KERN COUNTY
VENTURA COUNTY
PURISIMA POINT
VANDENBERG AIR FORCE BASE
Lompoc Casmalia Road
SURF
State Route 246
Central Ave
LOMPOC
SANTA RITA
LOS OLIVOS
BALLARD
Alamo Pintado Rd
Refugio Rd
Edison
State Route 154
BUELLTON
SOLVANG
SANTA YNEZ
POINT ARGUELLO
Route 1
LAS CRUCES
SANTA YNEZ RIVER
U.S. Highway 101
GAVIOTA
POINT CONCEPTION
Cathedral Oaks Rd
Foothill Rd
State St
MONTECITO
East Valley Rd
Hollister Ave
GOLETA
Cliff Dr
SANTA BARBARA
SUMMERLAND
CARPINTERIA
N
ENVIRONMENTAL BIOLOGY VALUE CLASSIFICATION

Santa Barbara County Environmental Biology: Tolerance-Intensity Classification

- Tolerant Only to Regulated Scientific Study (1-1)
- Tolerant Only to Very Light Intensity Recreation (2-2)
- Tolerant Only to Light Intensity Recreation (2-3)
- Tolerant Only to Moderate Intensity Recreation (2-4)
- Tolerant Only to Heavy Intensity Recreation (2-5)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Heavy Intensity Recreation (7-5)



ENVIRONMENTAL BIOLOGY TOLERANCE INTENSITY CLASSIFICATION

South Coast Study Area ~ East Environmental Biology: Value Classification

- Unusual or Delicate Habitat, Endangered Species, and Scientific Study Area (1)
- Unusual or Delicate Habitat and Scientific Study Area (5)
- Unusual or Delicate Habitat (6)
- Scientific Study Area (7)


LOS PADRES NATIONAL FOREST
STUDY AREA BOUNDARY
VENTURA COUNTY
SANTA BARBARA COUNTY
Canyon Road
Sycamore
East Valley Road
MONTECITO
State Street
Anapamu St
Milpas Street
San Ysidro Rd
Sheffield Dr
Toro Canyon Road
Cabrillo Blvd
Carrillo St
Drive
SUMMERLAND
Foothill Road
CARPINTERIA
Linden Ave
Casitas Pass Road
Rincon Rd
SANTA BARBARA
N
ENVIRONMENTAL BIOLOGY VALUE CLASSIFICATION

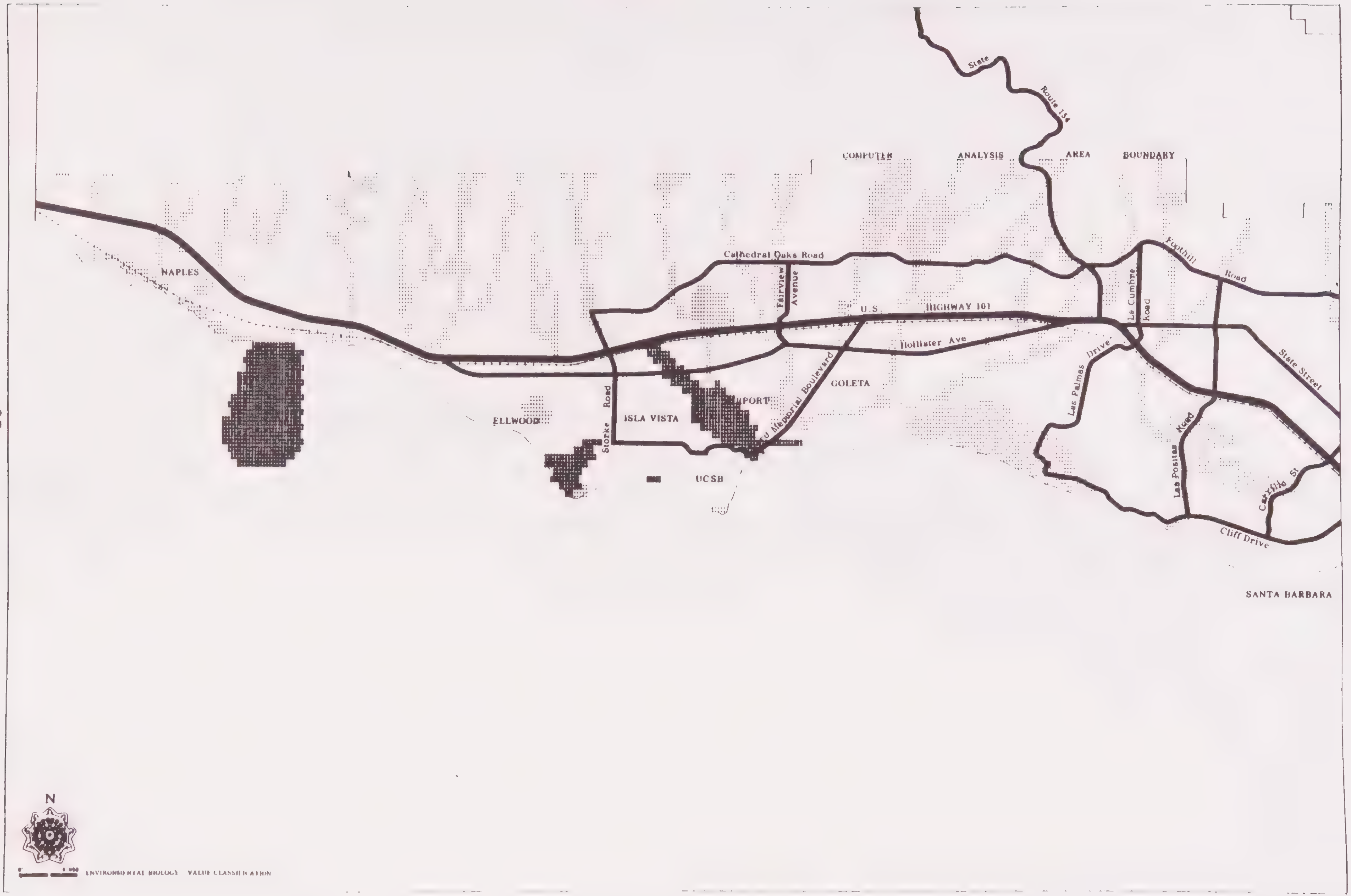
South Coast Study Area ~ East Environmental Biology: Tolerance-Intensity Classification

- Tolerant Only to Regulated Scientific Study (1-1)
- Tolerant Only to Very Light Intensity Recreation (2-2)
- Tolerant Only to Light Intensity Recreation (2-3)
- Tolerant Only to Moderate Intensity Recreation (2-4)
- Tolerant Only to Heavy Intensity Recreation (2-5)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Heavy Intensity Recreation (7-5)

LOS PADRES NATIONAL FOREST
STUDY AREA BOUNDARY
VENTURA COUNTY
SANTA BARBARA COUNTY
MONTECITO
SUMMERLAND
CARPINTERIA
SANTA BARBARA
State Street
Milpas Street
Foothill
Road
Rincon Rd.
N
ENVIRONMENTAL BIOLOGY TOLERANCE INTENSITY CLASSIFICATION

South Coast Study Area ~ West Environmental Biology: Value Classification

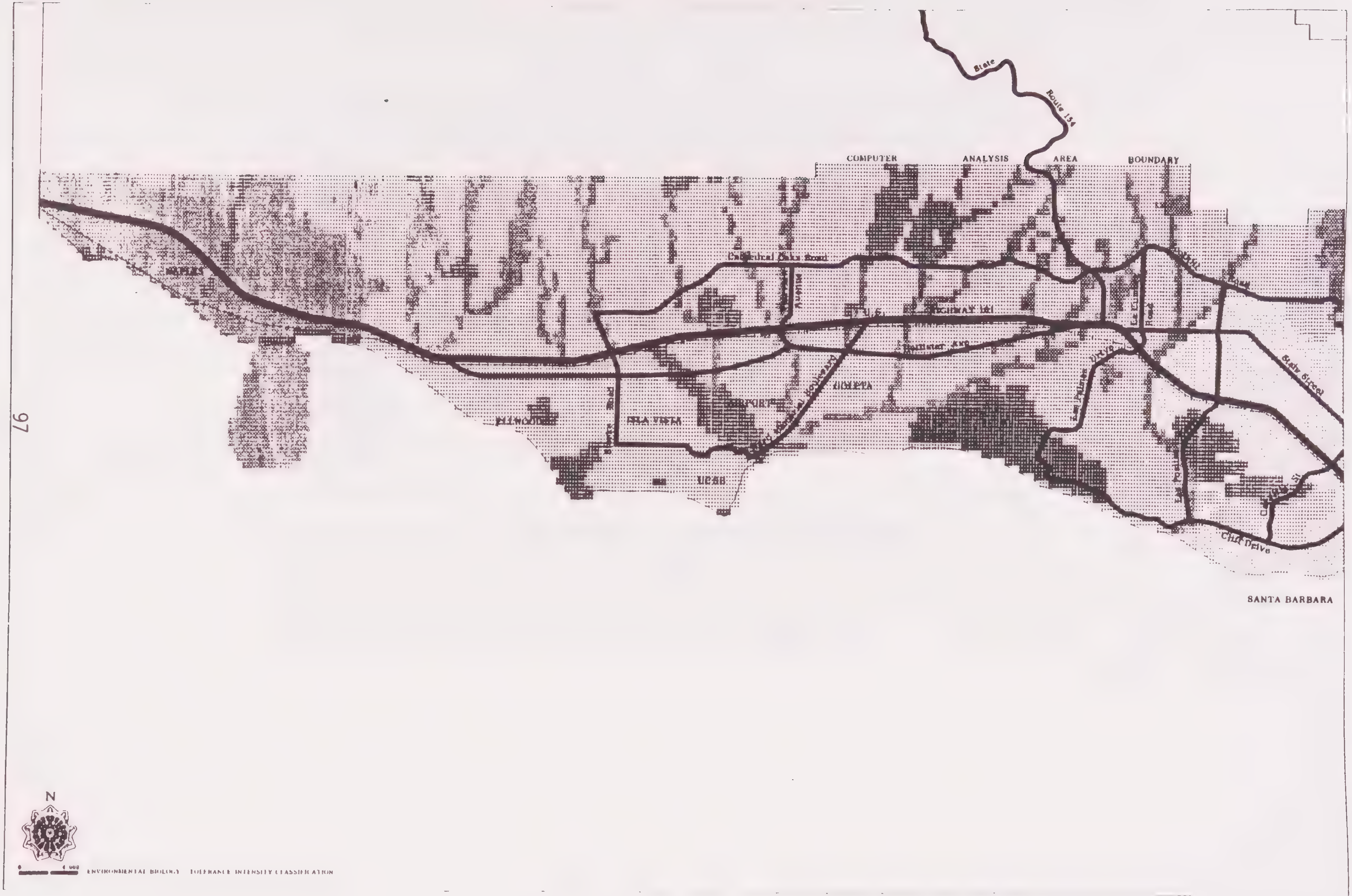
- Unusual or Delicate Habitat, Endangered Species, and Scientific Study Area (1)
- Unusual or Delicate Habitat and Scientific Study Area (5)
- Unusual or Delicate Habitat (6)
- Scientific Study Area (7)



ENVIRONMENTAL BIOLOGY VALUE CLASSIFICATION

South Coast Study Area ~ West
Environmental Biology:
Tolerance-Intensity Classification

- Tolerant Only to Regulated Scientific Study (1-1)
- Tolerant Only to Very Light Intensity Recreation (2-2)
- Tolerant Only to Light Intensity Recreation (2-3)
- Tolerant Only to Moderate Intensity Recreation (2-4)
- Tolerant Only to Heavy Intensity Recreation (2-5)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Heavy Intensity Recreation (7-5)



ENVIRONMENTAL BIOLOGY TOLERANCE INTENSITY CLASSIFICATION

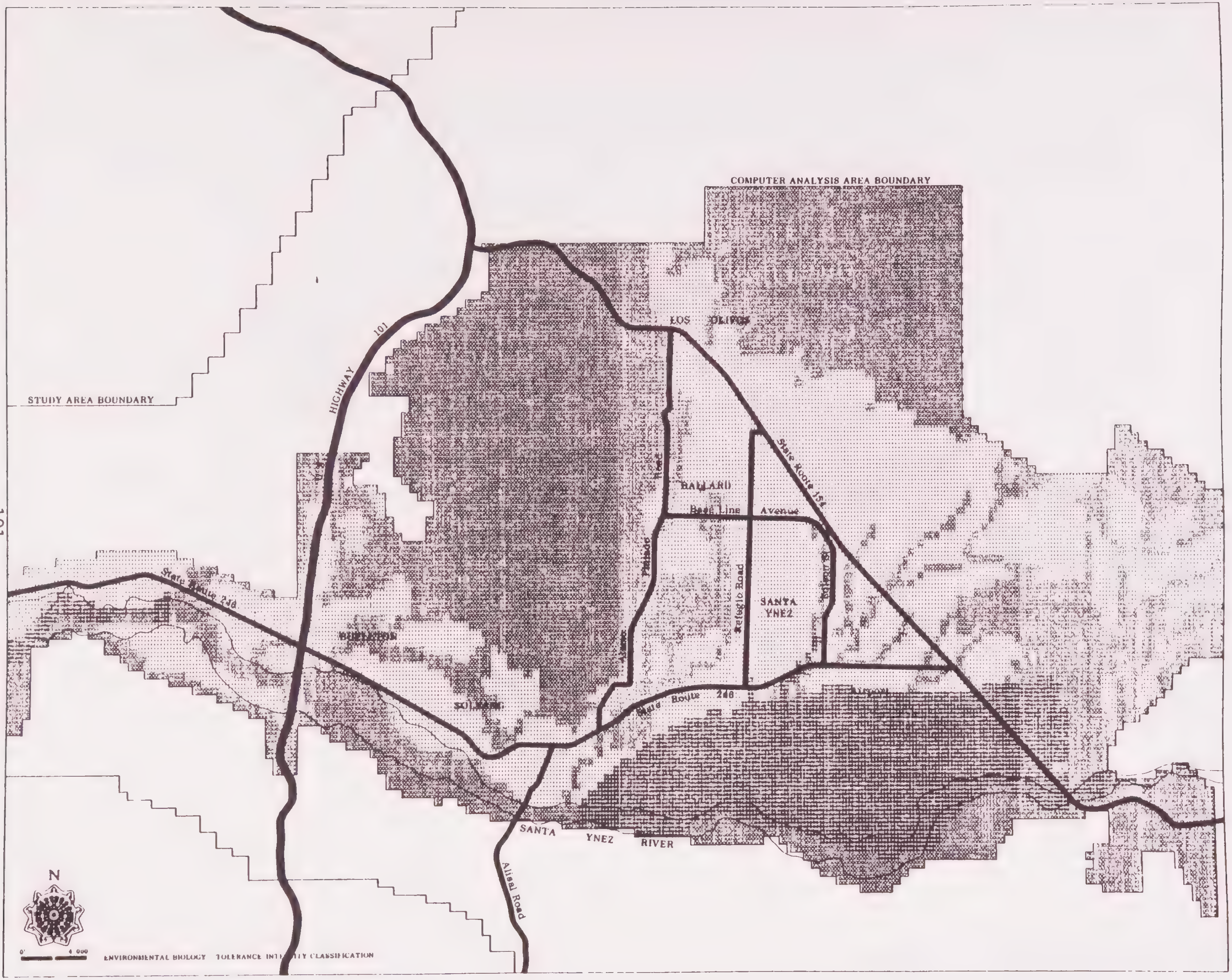
Santa Ynez Valley Study Area Environmental Biology: Value Classification

Unusual or Delicate Habitat (6)

ENVIRONMENTAL BIOLOGY - VALUE CLASSIFICATION

Santa Ynez Valley Study Area Environmental Biology: Tolerance-Intensity Classification

- Tolerant Only to Very Light Intensity Recreation (2-2)
- Tolerant Only to Light Intensity Recreation (2-3)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)


COMPUTER ANALYSIS AREA BOUNDARY
STUDY AREA BOUNDARY
HIGHWAY 101
LOS OLIVOS
BALLARD
Base Line Avenue
State Route 154
Refugio Road
SANTA YNEZ
State Route 246
SOLVANG
SANTA YNEZ RIVER
Alisal Road
N
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ENVIRONMENTAL BIOLOGY
TOLERANCE
CLASSIFICATION

Lompoc Study Area
Environmental Biology:
Value Classification

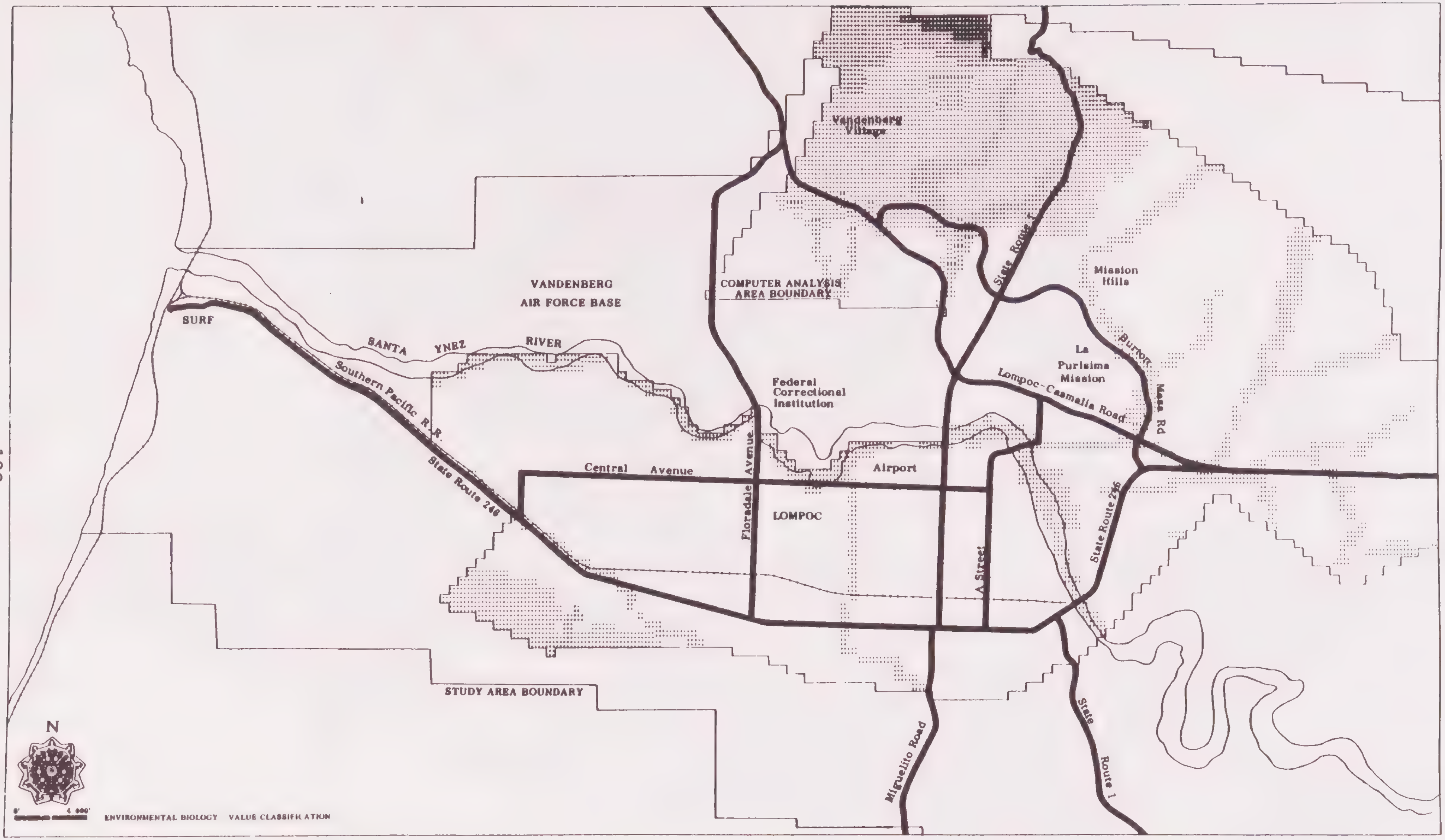
Unusual or Delicate Habitat and Endangered Species (2)

Endangered Species (4)

Unusual or Delicate Habitat and Scientific Study Area (5)

Unusual or Delicate Habitat (6)

Scientific Study Area (7)


Vandenberg Village
VANDENBERG AIR FORCE BASE
COMPUTER ANALYSIS AREA BOUNDARY
Mission Hills
SURF
SANTA YNEZ RIVER
State Route 1
Burton Mesa Rd
La Purisima Mission
Lompoc-Casmalia Road
Federal Correctional Institution
Southern Pacific R.R.
Central Avenue
Airport
State Route 246
Floradale Avenue
LOMPOC
A Street
STUDY AREA BOUNDARY
Miguelito Road
N
ENVIRONMENTAL BIOLOGY VALUE CLASSIFICATION

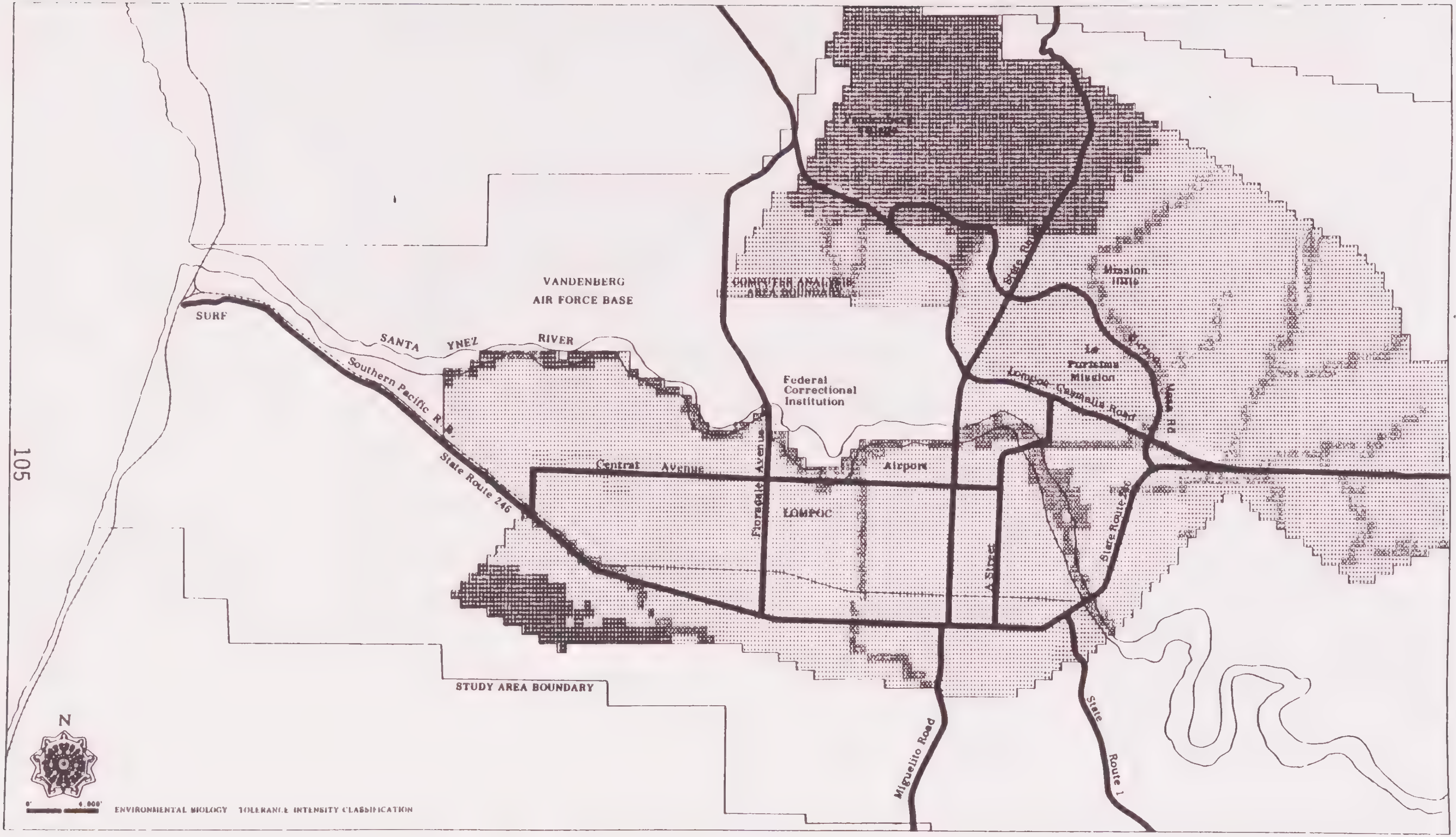
Lompoc Study Area
Environmental Biology:
Tolerance-Intensity Classification

Tolerant Only to Very Light Intensity Recreation (2-2)

Tolerant Only to Light Intensity Recreation (2-3)

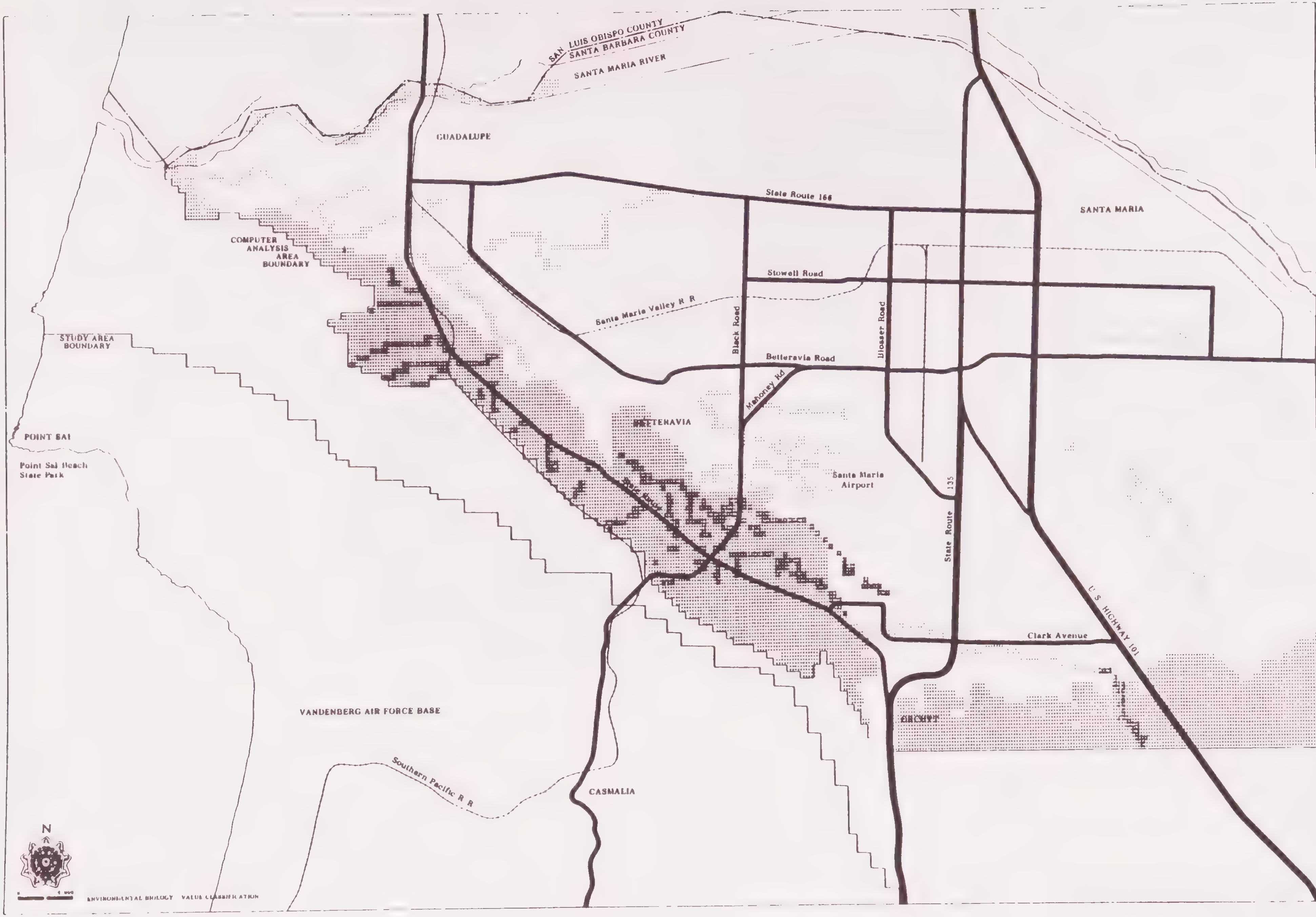
Tolerant Only to Moderate Intensity Recreation (2-4)

Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)


VANDENBERG
AIR FORCE BASE
SURF
SANTA YNEZ RIVER
Southern Pacific R.R.
State Route 246
Federal
Correctional
Institution
Mission
La
Purisima
Mission
Lompoc-Casmalia Road
Central Avenue
Floradale Avenue
Airport
LOMPOC
STUDY AREA BOUNDARY
Miguelito Road
State Route 1
N
0'
ENVIRONMENTAL BIOLOGY TOLERANCE INTENSITY CLASSIFICATION

Santa Maria-Orcutt Study Area
Environmental Biology:
Value Classification

	Unusual or Delicate Habitat and Endangered Species (2)
	Endangered Species (4)
	Unusual or Delicate Habitat (6)


SAN LUIS OBISPO COUNTY
SANTA BARBARA COUNTY
SANTA MARIA RIVER
GUADALUPE
State Route 166
SANTA MARIA
COMPUTER ANALYSIS AREA BOUNDARY
Stowell Road
Santa Maria Valley R R
Black Road
Blosser Road
Betteravia Road
STUDY AREA BOUNDARY
Mahoney Rd
BETTERAVIA
POINT SAL
Point Sal Beach State Park
Santa Maria Airport
State Route 135
U S HIGHWAY 101
Clark Avenue
VANDENBERG AIR FORCE BASE
Southern Pacific R R
CASMALIA
N
ENVIRONMENTAL BIOLOGY VALUE CLASSIFICATION

Santa Maria-Orcutt Study Area
Environmental Biology:
Tolerance-Intensity Classification

- Tolerant Only to Very Light Intensity Recreation (2-2)
- Tolerant Only to Light Intensity Recreation (2-3)
- Tolerant Only to Moderate Intensity Recreation (2-4)
- Tolerant Only to Heavy Intensity Recreation (2-5)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Moderate Intensity Recreation (7-4)
- Tolerant to Agriculture, Managed Production of Commercial Biological Resources, or Heavy Intensity Recreation (7-5)


SAN LUIS OBISPO COUNTY
SANTA BARBARA COUNTY
SANTA MARIA RIVER
GUADALUPE
State Route 166
SANTA MARIA
COMPUTER ANALYSIS AREA BOUNDARY
Stowell Road
Santa Maria Valley R R
Blosser Road
STUDY AREA BOUNDARY
POINT SAL
Point Sal Beach State Park
Santa Maria Airport
State Route 135
Clark Avenue
HIGHWAY 101
VANDENBERG AIR FORCE BASE
Southern Pacific R R
CASMALIA
N
ENVIRONMENTAL BIOLOGY TOLERANCE INTENSITY CLASSIFICATION

anywhere without damaging the community. At the opposite extreme, off-road recreation vehicles (ORV's) create erosion, mar the landscape, grind plants, frighten animals, and annihilate the natural environment. In an area heavily used by ORV's, few species survive.

The intensity concept adds information to the tolerance scheme. Although intensities were used only to describe recreation activities, they can also be applied to other kinds of activities. For example, commercial exploitation of a resource can be governed by intensity; a party of sport fishermen does not deplete an area to the extent that a fishing fleet does. Similarly, intensities can be applied to agricultural uses. Grazing is less environmentally destructive than is irrigated agriculture.

We have not treated in any detail areas that are now used for urban and agricultural purposes because these generally are not of much biological interest. Activities in these areas, of course, can affect the rest of the County; examples are smog from automobiles harming vegetation, and pesticides or feedlot runoff affecting natural communities elsewhere. While it is clear that some of these activities have more severe effects than others (for example irrigated truck crops probably have more external effects than does light grazing), we nevertheless do not feel competent to make recommendations on the particular use to which agricultural and urban areas should be put. On the maps, therefore, all such areas are designated as tolerant of "agriculture, managed production, and recreation" (7), and "heavy intensity use" (5). Each area mapped for such use includes the area presently used plus some additional area for expansion. We do not mean to imply by this that such uses necessarily should expand to fill the mapped areas; we simply tried to indicate where, on the basis of topography and biotic communities, such uses could expand without destroying interesting ecological areas.

Exceptions to this procedure occur when mapped ecological units, designated as tolerating only light or moderate recreation use, overlap areas presently being used for various kinds of farming. Certain ecological communities occur only on flat or gently sloping lands, and such lands frequently are used for commercial agricultural production. The future survival of these communities obviously is threatened by such intensive use. Therefore, we have drawn our maps to call attention to such conflicts of interest. To rescue such communities as the Central Oak Woodland, Native Grassland, and Lowland Riparian Wood-

land (categories 60, 50, and 75), suitable examples of these habitats must be set aside to permit recovery of the natural community by careful ecological management. Unless such actions are taken, these ecological communities are doomed to extinction.

Buffer Zones

In setting aside an area to preserve its natural ecological community or a rare species, it is important to establish a zone of reduced use surrounding the preserve, because all communities affect others adjacent to them. To protect streams in areas being logged, the federal Bureau of Land Management currently has a policy of leaving a 100 foot strip on either side of a stream that is used for fishing (Sadler, 1970). Likewise, the federal Water Pollution Control Administration (1970) recommends buffer strips 75 feet wide on either side as the minimum width to protect streams. Clearly, such protection enhances the area downstream as well as the area within the buffer strips. These widths initially were designated with the impact of logging in mind, but they also are appropriate where agriculture and urban development are likely to affect streams.

In general, the boundaries of an unusual or delicate habitat on our maps were drawn in such a way as to include a buffer zone around it. Sometimes the surrounding zone was designated as tolerating use of a low intensity. Streams selected for preservation either had buffer zones drawn roughly 100 feet on each side, or the adjacent vegetation received a low classification for tolerance and intensity of use.

Sources and Accuracy of Mapped Information

Most of the details of the distribution of the plant communities for the study area maps were taken from a series of U.S. Forest Service maps entitled "Vegetation Types of California" made between 1935 and 1945 by the Regional Forester's Office in San Francisco. The maps, many of which have not been published, are filed in the Map Room of the University of California, Santa Barbara, Library.

Enlarging these small maps 2.5 times to the scale of 1 inch equals 2,000 feet introduced inconsistencies due to photographic distortion and inaccuracies in the original maps. Therefore, physical features such as streams and topography were used to ensure that vegetation zones were correctly located. Without extensive investigation, it is

impossible to gauge just how close our mapped ecological communities are to the positions of the actual ones. However, for the purpose of indicating the presence of broad ecological zones the maps are adequate.

SPECIES AND ECOLOGICAL COMMUNITIES OF PARTICULAR VALUE

Those species and ecological communities on the mainland of the County that are of unusual ecological interest and in need of special protection will be described in this section, with rare and endangered birds, reptiles, mammals, and plants discussed first. It should be remembered that the traditional view of preservation, as demonstrated by this list, is very narrow. There is no way to preserve birds, reptiles, mammals, and plants without preserving their environment, which includes a myriad of other species that live in the same ecosystem. Next, we discuss ecological communities that either are rare and/or endangered, or are the prime examples of ecological communities that are common in the County and are not endangered as yet. The high priority areas generally are designated "light recreation" (2-2), but if they are especially vulnerable, they are designated "no other use", i.e. scientific use only (1-1). Only coastal dunes and native grassland fall in this latter category. Species included in the bird, reptile, and mammal sections are taken from At The Crossroad, a volume about rare and endangered species prepared by the California Department of Fish and Game in 1974.

Birds

California Condor (Gymnogyps californianus) — This magnificent bird is now limited in range to portions of the coastal counties from Monterey to Los Angeles, and the interior Kern, King, Tulare, and Fresno counties. Its rapidly shrinking range once extended from Napa to San Diego and inland to San Bernadino County, but present areas of maximum use include only northern Santa Barbara County and central Ventura County.

The present population described by Koford (1953) as "stable" consists of about 40 birds. Unhappily, the birds have an extremely low fecundity; sexual maturity is attained at 5 or 6 years of age, one female can produce an egg only once each two years, incubation and brooding of a chick takes at least six months. In addition, the chick is totally dependent on the parent until it is about 12 months old. Obviously, the trickle of young into the population is painfully slow,

so that disturbance of the breeding population (which might disrupt reproduction) or loss of adult birds can rapidly reduce the size of the population, thus driving the animals to extinction.

Preservation of the species will require a firm commitment to the maintenance of a suitably large refuge. Since a small habitat will support fewer organisms than a large one, we cannot reduce the suitable habitat of this species without losing the Condor. It is recommended that a large portion of northeastern Santa Barbara County be regarded as "for the birds". Hunting should not be allowed in nesting and roosting areas. Koford (1953) reports that about one bird a year was shot in the past.

Peregrine Falcon (Falcon peregrinus) — This superb falcon is becoming extremely rare. It is believed to no longer be reproducing east of the Rocky Mountains. According to the State Department of Fish and Game, of the 10 active nests along the entire California coast, the one closest to Santa Barbara County is the oft-plundered nest on Morro Rock. The Peregrine Falcon formerly nested on Santa Cruz Island, and recent sightings have been recorded at the Goleta Slough and in the San Rafael Wilderness. In the foreseeable future no Peregrine Falcon nests can be expected in Santa Barbara County. Birds will occasionally be seen, but these almost certainly will be migrants. The most likely potentially suitable nesting habitats for this dying species will be the Channel Islands (Santa Rosa, San Miguel, and Santa Cruz) and, perhaps, Vandenberg Air Force Base. These areas are relatively undisturbed, and every effort should be made to keep them attractive to these birds.

Southern Bald Eagle (Haliaeetus leucocephalus) — Although not as rare as the Peregrine Falcon, this species, our national bird, is rapidly diminishing in numbers and faces the threat of extinction. According to Waldo Abbott of the Santa Barbara Museum of Natural History, several eagles nested in the late 1930's along the South Coast (Dos Pueblos Ranch, Rincon Creek, Mission Creek, Santa Cruz Island, and Anacapa Island) with the Dos Pueblos Ranch nest remaining active for about twenty years.

There have been few recent sightings in the County. One bird, probably a migrant, was seen at the Santa Barbara Bird Refuge in the fall

of 1971. Slightly more encouraging, however, is the almost yearly appearance of several wintering birds at Lake Cachuma. Metcalf (1972) comments that one to four birds have wintered at Cachuma in eight of the past eleven years. If we expect these birds to continue to use the area, it is imperative that portions of the lake be left undisturbed. The present policy of limiting camping and recreational activity to the western two-thirds of the lake is suitable. Under no circumstances should the eastern end of the lake be opened to human use; the continuing presence of the eagles may depend on it.

The California Brown Pelican (Pelicanus occidentalis) — To anyone who has seen the grace and ease with which this bird soars within inches of a cresting wave, the possibility of its extinction comes as a shock. Yet, although this bird is a common sight along the County's sea shore, few people realize that there is only one nesting colony along the entire California coast. When it was discovered that this colony of some 300 pairs on Anacapa Island had produced only three young in 1970, the public was horrified. In the past three years the picture has brightened slightly as 7, 57, and 34 young have been successfully reared. In the 1972 season a portion of the colony nested on Santa Cruz Island, a fact of immediate interest to Santa Barbara County.

If the Anacapa colony is to continue to reproduce, it must not be disturbed. Pleasure craft should not be allowed to go as close to the colony as they presently do. Non-reproducing birds seem to tolerate human activity because they frequent harbors, but efforts should be made to restrict human activity in the vicinity of island roosts.

California Least Tern (Sterna albifrons) — The Least Tern, a summer visitor to the western United States, formerly nested in large groups on Santa Barbara and Carpinteria beaches according to Metcalf (1972). Recently, the birds have nested only at the mouths of the Santa Clara and Santa Ynez Rivers, and most birds reported are migrants. The California Least Tern has been largely eliminated from its former range by human activity.

Clapper Rail (Rallus longirostris) — The light footed race of the Clapper Rail is now extremely rare. Until 1959, a small group had been known in the Carpinteria Slough; a 1969 report from the Goleta Slough is the only more recent sighting in the County. These birds, restricted to coastal sloughs and estuaries, may be on the verge of

disappearance in California because the number of coastal estuaries has declined and the environmental quality of the sloughs has deteriorated. If these birds are to survive in Santa Barbara County, every effort should be made to preserve the size and quality of the three existing South Coast sloughs (Devereux, Goleta, and Carpinteria).

Savanna Sparrow, Belding's Race (Passerculus sandwichensis beldingi) — The Belding's race of the Savanna Sparrow, like the Clapper Rail, is restricted to sloughs and salt marshes, where Pickleweed (Salicornia) is abundant. The sparrow is suffering the same fate as the rail, for largely the same reasons. The last census of the bird revealed only 11 breeding sites in Southern California, with 1,100 pairs of birds. To preserve this bird, strict conservation measures must be applied to the South Coast sloughs.

California Black Rail (Laterallus jamaicensis) — This bird is known to breed near San Diego, and perhaps in other sloughs and estuaries as far north as San Francisco, Sightings in Santa Barbara County are very irregular because the birds are extremely secretive. Because only sloughs provide the suitable habitat, their preservation is essential if the Black Rail is to be found in the County.

Reptiles

Blunt-nosed Leopard Lizard (Crotaphytus silus) — This lizard occurs in the extreme northeastern part of the County (Montanucci, 1970). Its entire range consists of only certain portions of the San Joaquin Valley and surrounding foothills (Stebbins, 1966). Suitable habitat for this interesting lizard, which can eat other lizards and even small mammals, occurs in the extreme lower portion of the Cuyama drainage and the adjacent Ballinger, Santa Barbara, and Quatal Canyons. However, the habitat required by this lizard is rapidly being ruined by ORV's and the expansion of agriculture. Montanucci comments that portions of Ballinger Canyon are so badly torn up that it is doubtful that the lizard persists in the area.

Southern Rubber Boa (Charina bottae umbratica) — This snake, a

true boa, has been recorded only in the mountainous areas of Riverside, San Bernadino, and Kern Counties. However, in Santa Barbara County, Madulce Peak, Big Pine Mountain, and San Rafael Mountain provide similar communities which probably include the Rubber Boa, and the snake may be unreported because it is extremely secretive.

Mammals

San Joaquin Valley Kit Fox (*Vulpes macrotis*) — The Kit Fox, a small, nocturnal carnivore weighing from four to six pounds, lives almost exclusively on Kangaroo Rats (*Dipodomys* spp.), and thus, its distribution largely coincides with that of the rodents. Presently, the fox is concentrated in the southern San Joaquin Valley. According to Lyndal Laughrin of the University of California, Santa Barbara, an expert on these foxes, large portions of the Cuyama Valley and surrounding area provide habitat suitable for them. Efforts to prevent the present rapid destruction of much of the Cuyama Valley should be commenced immediately. ORV's, hunting, and predator poisoning should not be allowed in areas shown on the maps that should be left in their natural state. An attempt to determine the numbers of foxes in the area also should be made.

Guadalupe Fur Seal (*Arctocephalus townsendii*) — One sighting has been recorded in Ventura County on San Nicolas Island in 1949. Even though there have been no Santa Barbara County sightings, the seal may occur rarely on several of the Channel Islands.

Plants

Species included in this section are taken from the list compiled by California Native Plant Society in 1971. Species occurring on the Channel Islands have not been included. The distribution of many species is not known exactly. However, we have indicated the probable range of distribution from the extent of the habitat in which specimens were collected.

Cirsium loncholepis Petrak (Gracious Thistle) Sunflower Family — This deep-rooted short-lived perennial without hair and with solitary or clustered flowers is found locally on coastal dunes and strand only in San Luis

Obispo and Santa Barbara Counties. The type locality (locality from which the plant was collected and named) of the plant is near La Graciosa.

Cirsium rhothophilum Blake (Surf Thistle) Sunflower Family — This bushy, deep-rooted, short-lived perennial densely covered with white hair has a white flower. It is found locally on coastal dunes and strand only in Santa Barbara County. The locality is the Surf Dunes and environs. Other coastal dunes also should provide suitable habitat.

Corethrogyne leucophylla Jepson (Branching Beach-aster) Sunflower Family — This perennial with stem tips ascending from a horizontal base, leaves of white wool, yellow disk flowers and violet ray flowers is found locally on coastal dunes, on coastal bluffs, and in coastal Pinus muricata stands. The type locality is Monterey.

Senecio blochmanae Sunflower Family — This low shrub with slender narrow leaves and yellow flowers is found locally on the Oso Flaco Dunes and probably in Vandenberg Dunes. The type locality is the mouth of the Santa Maria River.

Arctostaphylos refugioensis Gankin (Refugio Manzanita) Heather Family — This manzanita notable for its broad stalkless leaves with bases partially surrounding the stems is found growing in chaparral in the Refugio Pass region of the County. The plant also has been seen in the Jualachichi Summit area on the Jalama Road, and unlocated populations exist in the intervening portions of the Santa Ynez Range.

Agrostis hooveri Swall (Hoover's Agrostis) Grass Family — This slender, densely tufted perennial grass with purplish flower heads occurs in dry, sandy places, especially in low woodlands. Suitable habitat exists from Santa Maria to the north slope of Purisima Hills.

Eriodictyon capitatum Eastw. (Lompoc Yerba Santa) Phacelia Family — This tall shrub with resinons, narrow, entire leaves and lavender flowers usually is associated with stands of Pinus muricata. Known localities include the top of the Harris Grade (Highway 1), Purisima Hills, Pine Canyon on Vandenberg Air Force Base, several places near Lompoc, and the slopes of the extreme western end of the Santa Ynez Mountains.

Thermopsis macrophylla var. agnina J. T. Howell (False Lupine)

Legune Family — This lupine-like, bright yellow flowered, robust perennial herb prefers chaparral, especially on ridgetops, for its habitat. One known locality is on the southwest-facing slopes of Santa Ynez Peak.

Chorizanthe blakleyi Hardham (Blakley's Chorizanthe) Buckwheat Family — This erect, slender, much branched, annual prefers chapparal and grassy habitats, and is distributed locally on the north slope of the Sierra Madre Mountains.

Chorizanthe breweri S. Wats. (Brewer's Chorizanthe) Buckwheat Family — This ascending to decumbent annual covered with short, grayish hairs is found in dry, rocky places in chaparral and oak woodland, commonly on serpentine, along the north slopes and canyons of the Sierra Madre Range. The only sample in the UCSB herbarium was collected in Schoolhouse Canyon.

Ceanothus impressus Trelease (Santa Barbara Ceanothus) Buckthorn Family — This low, evergreen, densely branched, blue flowered shrub with deeply grooved upper leaf surfaces is found in chaparral in Santa Barbara and San Luis Obispo Counties only. Two known localities are Burton Mesa and the Titan Gate Area of Vandenberg Air Force Base.

Cordylanthus littoralis J. F. Macbride (Seaside Bird's Beak) Snapdragon Family — This small diffusely branched annual with a white flower with purple markings prefers the inland sides of coastal strands and dunes, especially where that habitat includes Pinus muricata. Although listed as growing in Santa Barbara County by the California Native Plant Society (1971), Munz (1973) believes the plant to occur only on the Monterey Penninsula.

Cordylanthus maritimus Nutt. (Saltmarsh Bird's Beak) Snapdragon Family — This small annual with loosely branching stems and a purple flower and hairy foliage is limited to coastal salt marshes from Oregon to northern Baja California. It has been collected in the Carpinteria Slough, and its presence is suspected in the County's other three coastal salt marshes (Goleta, Devereux, and Surf).

Scrophularia atrata Pennell (Black-flowered Figwort) Snapdragon Family — This rather tall, leggy, perennial herb with square stems, opposite leaves and a small, dark maroon flower lives in dry

rocky places, particularly if rich in diatomaceous earth. Coastal sage scrub generally is the community with which the plant is associated. Known localities are near Lompoc in the Purisima Hills and in Surf.

Ecological Communities of Greatest Interest

Within the County, fourteen ecological communities have been judged as either rare and/or endangered. The following summary descriptions list the characteristic plants within each community and the major locations. More detailed information, including the value, tolerance, and intensity classifications assigned to each area, is presented in the section on Mapped Areas and Communities.

High Montane Coniferous Forest (Mixed Coniferous Forest) — The plant community consists of large coniferous trees which are characteristic of the Sierra Nevada Mountains. Elements of the community include Sugar Pine (Pinus lambertiana), Jeffrey Pine (Pinus jeffreyi), Ponderosa Pine (Pinus ponderosa), White Fir (Abies concolor), Incense-cedar (Libocedrus decurrens), and California Black Oak (Quercus kelloggii).

The Mixed Coniferous Forest, according to Munz (1970), is found in Southern California in areas with an elevation of 5,000 to 8,000 feet. In Santa Barbara County, this plant community only is well developed on the peaks of Big Pine, Madulce, and San Rafael Mountains. While California Black Oak is not found on these three mountains, it is found on the Zaca-Figueroa Ridge and on Little Pine Mountain.

Mixed Evergreen Forest — This plant community consists of trees and shrubs commonly associated with the cool redwood forests of the northern coast ranges and the Sierra Nevada. Characteristic plants include Tanoak (Lithocarpus densiflora), Madrone (Arbutus menziesii), California Bay (Umbellularia californica), Bigleaf Maple (Acer macrophyllum), and California Huckleberry (Vaccinium ovatum). In the County, this community exists only on the cool, north-facing slopes and canyons of the Santa Ynez Range. Known localities include the north-facing slopes on Mt. Tranquillon, Kinevan Canyon, Painted Cave, Jualachichi Summit, and the north face of the Santa Ynez — especially between Gaviota and San Marcos Passes.

Closed Cone Pine Forest — Bishop Pine (Pinus muricata), the only closed cone pine in Santa Barbara County, is distributed spottily in areas which receive the cool damp oceanic influence. The tree is uncommon both statewide and in the County. Besides being limited to coastal localities, the trees are generally found on low hills and flats. Known localities include Vandenberg Air Force Base, Mt. Tranquillon, the Purisima Hills, an area near Orcutt, the extreme western end of the Santa Ynez Mountains, Jualachichi Summit, and small areas on hills near Lompoc.

Douglas Fir Forest — The Douglas Fir (Pseudotsuga menziesii), the most important lumber tree in North America, also is known as the "Oregon Pine". As the name implies, the focus of the tree's distribution is the Pacific Northwest, typically in the Mixed Evergreen Forest, a community occurring primarily in cool, moist climates. An extremely small stand of Douglas Fir, approximately twenty trees in a canyon of the Purisima Hills, is growing on a diatomaceous shale within a group of Bishop Pine (Pinus muricata). This is the southernmost natural grove known and, as such, is of great scientific interest.

Southern Oak Woodland — This plant community, as defined by Munz (1973), is now quite uncommon due to the rareness of the California Walnut (Juglans californica), an important indicator species. California Walnut (Juglans californica) is found in only four localities in the County, with the two best stands along Jalama and Rincon Creeks. Coast Live Oak (Quercus agrifolia) and other community components also occur at these two spots.

Coastal Dune and Strand — This unique and very delicate community occurs in several places in coastal Santa Barbara County but only about half of these are in an undisturbed state. Dunes can be found north of Point Sal (severely disturbed), between Point Sal and Purisima Point (slightly disturbed), south of Purisima Point (slightly disturbed), around Surf (moderately disturbed), and in Devereux Dunes (part slightly disturbed, and part moderately disturbed). Coastal dunes and strand support an extremely distinctive flora, which deteriorates rapidly with traffic.

Coastal Salt Marsh — This habitat occurs in the following estuaries or sloughs: Surf, Devereux, Goleta, and Carpinteria.

Coastal Bluff — The uncommon plant community in this habitat resides

on the steep terrain between the extreme intertidal and the point at which the incline becomes level, with the best examples in the Point Sal area and on Santa Cruz Island. On the South Coast, the dominant plants include Atriplex spp., Coreopsis spp., Dudleya spp., Encelia californica, Opuntia spp., Phacelia spp., and Rhus intergrifolia. North of Point Conception, the floristic composition of the community changes with the addition of Amsinckia spectabilis and Erigeron glaucus. Certain plants also are lost north of Point Conception. Due to the typical steepness of its habitat, any activity which accelerates erosion, such as agriculture, grazing, or construction, is a peril to this community.

Native Grassland — Prior to the introduction of domestic grazers and non-native grasses, large portions of the state were covered with native grasses. At present, native grassland is almost nonexistent. Isolated patches of some native grasses grow in the County; probably the largest patch is along Las Tunas Road in Santa Barbara. Other small patches border Camino Cielo Road along the crest of the Santa Ynez range and the coast, west of Goleta.

Interior Cypress Forest — According to the fossil record, Cypresses are not as successful as they once were. Throughout the state, cypresses occur in small patches and usually grow on poor soils. In Santa Barbara County the sole Cypress grove (a stand of Cupressus sargentii) is located just northeast of Zaca Lake.

Canyon Oak - Big Cone Spruce — In general, the Big Cone Spruce (Pseudotsuga macrocarpa) is most common in the eastern third of the County, but small groups of trees are scattered throughout the County in places such as Figueroa Mountain. Its association with the Canyon Oak (Quercus chrysolepis) is limited, however.

Coulter Pine Forest — Coulter Pines (Pinus coulteri) are widely scattered throughout the County. The best example of these trees may be seen on Figueroa Mountain and in the Miranda Pine Mountain area of the Sierra Madre Range.

Rare Freshwater Habitats — Vernal pools are temporary standing bodies of water, found usually in small depressions which drain freshwater runoff and are underlain by non-porous soil. They are most common

in the San Joaquin Valley, but are patchily distributed throughout the state. Because of their temporary nature, vernal pools support a highly specialized set of species, many of which only can be found in vernal pools.

Zaca Lake is Santa Barbara County's only natural lake. It is small (less than one mile in circumference, and only 46 feet deep), but is extremely picturesque.

Freshwater marshes are rare plant communities in the state, providing a unique habitat with a long growing season and relatively constant physical conditions. Very few freshwater marshes occur in the County. Several spots along the Santa Ynez River support freshwater marsh communities; other small marshes can be found in Goleta along San Antonio Creek and on the edge of the slough.

Well-preserved Marine Intertidal Zones — Examples of well-preserved intertidal zones are rare. At present, there may be very short stretches of the habitat along the beaches of Vandenberg Air Force Base. Most beaches in the County have been depleted of some of the larger and more conspicuous species. At present, even with newly enacted laws, it is still possible to collect anything which is edible. Furthermore, many beach users ignore or are unfamiliar with the laws and collect ornamental items such as shells and starfish. Fishermen use numerous worms and mussels for bait. Curious beach-goers kill many organisms by walking on them, exposing them to harsh conditions (by turning rocks), or by picking them up. As more and more intertidal areas are thus depleted of organisms, the process of replacement of lost individuals by young is slowed and even halted.

Prime Examples of Common Ecological Communities

In the following section, we delineate prime examples of ecological communities which are not uncommon. We believe that the relatively small areas we mark as prime examples, however, should receive the same consideration and treatment as communities previously listed that are rare or unusual in the County. Prime examples are patches within a large expanse of a given plant community that possess the dominant species of the community, and that remain in a relatively undisturbed state.

Prime examples have been mapped for the following categories:

13. Exposed Rocks, subtidal
40. Coastal Sage
41. Great Basin Sage
43. Chamise Chaparral
44. Mixed Chaparral
46. Serpentine Chaparral Associations
48. Montane Chaparral
60. Central Oak Woodland
62. Pinyon Juniper Woodland
64. Foothill Woodland
90, 92. Freshwater Streams

Exposed Rocks, subtidal (13) — Naples Reef is a prime example of this community. It is well known to scientists and recreational users as the best reef in the South Coast area. It supports an extremely large and diverse biota. Naples Reef is offshore, approximately six miles west of Goleta.

Coastal Sage (40) — This community, sometimes called "soft chaparral", is abundant in the County and usually found on dry and rocky slopes below the chaparral. The community is dominated by California Sage (Artemisia californica). Prime examples can be found along Jalama Road and on the lower, southern flanks of Figueroa Mountain.

Great Basin Sage (41) — This plant community, dominated by Great Basin Sage (Artemisia tridentata), is extremely abundant in several western states and in eastern California. In Santa Barbara County, it can only be found in the Cuyama River Basin. The prime examples of the community occur in Ballinger, Quatal, and Santa Barbara Canyons. They support two endangered animals: Blunt-nosed Leopard Lizard (Crotaphytus silus) and San Joaquin Valley Kit Fox (Vulpes macrotus). We have delineated the habitat in the bed of the Cuyama River and its adjoining canyons. Since this area has been damaged extensively by ORV use (Montanucci, 1970), the precise area to be preserved should be determined by a field survey.

Chamise Chaparral (43) — This community, dominated by Chamise (Adenostoma fasciculatum), also is abundant in the County, and a prime example occurs on the slopes of Refugio Canyon. In this area,

the community also contains a patch of the interesting parasitic plant Indian Warrior (Pedicularis densiflora).

Mixed Chaparral (44) — The prime example of this community is found on both sides of the San Marcos Pass area and to the east in the mountains. The community is composed of the following dominant genera: Rhamnus, Ceanothus, Arctostaphylos, Cercocarpus, Heteromeles, Yucca, Adenostoma, Prunus, Quercus, Rhus.

Serpentine Chaparral Association (46) — Because of its peculiar mineralogical properties, serpentine soil supports unusual plant communities. Certain characteristic species may be absent, while the community may be enriched by other unusual species. Prime examples of serpentine chaparral occur near Figueroa Mountain, close to De La Guerra Spring and Ranger Peak.

Montane Chaparral (48) — Different species of several lowland chaparral genera compose the Montane Chaparral community, including Ceanothus, Arctostaphylos, and Quercus. A prime example of this high altitude chaparral occurs in the McKinley Mountain lookout area.

Central Oak Woodland (60) — The dominant tree in the Central Oak Woodland is Valley Oak (Quercus lobata), which is widely distributed in the Santa Ynez Valley. A prime example occurs in Happy Canyon, and a more open savanna woodland occurs adjacent to the Santa Ynez River between Solvang and Lake Cachuma.

Pinyon-Juniper Woodland (62) — This plant community, usually found at elevations between 5,000 and 8,000 feet, is dominated by Pinyon Pine (Pinus monophylla) and California Juniper (Juniperus californica). The community is much more common in the desert portions of the state, but is well represented in the northeastern Sierra Madre Mountains of Santa Barbara County near upper Cuyama Valley with a prime example extending about six miles east of Fox Mountain.

Foothill Woodland (64) — This plant community, dominated by Digger Pine (Pinus sabiniana) and several oaks usually is found on the slopes of inland valleys in the central portion of the County with some of the best examples located on the lower slopes of Figueroa Mountain.

Freshwater Streams (90, 92) — Most of the small freshwater streams in

the County are intermittent, but a few flow continuously over short stretches. The following were chosen as prime examples:

Rattlesnake Creek, Mission Creek, San Roque Creek, San Jose Creek, Dos Pueblos Creek, Tajiguas Creek, Arroyo Hondo Creek, Refugio Creek, Jalama Creek.

MAPPED AREAS AND COMMUNITIES

The following section contains a set of detailed descriptions of the different categories of ecological communities. It explains how we made our decision to classify each one as to its tolerance to a particular type and intensity of use. The numbers refer to the categories shown on the maps on file in the County Planning Department. All areas of ecological interest that were mapped are analyzed in this section. Following each location, the ratings assigned for value, tolerance and intensity of use are noted in parentheses. The code numbers refer to the list in Table 1. The distribution of the value and tolerance-intensity classifications is shown on the computer maps.

Coastal Strand and Marine Habitats

12. Exposed or Protected Rocky Intertidal Areas — Rocky points are noted for a distinctive and abundant biota. Only highly adapted organisms can tolerate conditions of an exposed rocky point — extreme wave shock, harsh and varying environmental conditions, and usually high intensity human use (and abuse). Also, all rocky intertidal areas are highly susceptible to disturbance and thus are very delicate. Rock turning (without returning), foot traffic, and handling are all highly injurious to intertidal forms. Collecting is destructive, and natural replacement by planktonic larvae of new individuals from other rocky points may be slow because rocky points usually are separated by long stretches of sandy beach.

Carpinteria Reef and Adjacent Coastal Bluffs (5-2-2)

Location: At the extreme southern edge of Carpinteria State Beach, together with the coastal bluffs for the next mile to the south.

Biological comments: The small reef exposed at low tide probably represents the most diverse intertidal area on the mainland south of

Point Arguello. Representatives of relatively large taxonomic groups are commonly present at Carpinteria Reef and absent in other areas. Some species, rarely encountered at all on the South Coast (*Elysia*, *Tigriopus*, etc.), have been seen in the Carpinteria intertidal zone.

Recommendations: Due to the general fragility of intertidal rocky habitats, any collecting at Carpinteria should be strictly prohibited, and recreational users should be educated as to the fragility of the intertidal zone. Clearly, the area is of high educational and scientific value.

Other North and South Coast Rocky Points

Locations:

Goleta Point (UCSB Campus Point), just west of Goleta County Beach (5-2-2)
Coal Oil Point, on the West Campus of UCSB (5-2-2)
Point Conception (5-2-2)
Point Arguello (5-1-1)
Purisima Point (5-1-1)
Point Sal (5-2-3)

Biological comments: Many plants, invertebrate animals, and conspicuous fish occur on or near rocky points. North of Point Conception a more diverse and entirely different fish community is to be found. Certain birds and mammals also frequent rocky points. Oystercatchers, certain Sandpipers, Turnstones, and Gulls all feed in the exposed rocky intertidal of points. The harbor seal (*Phoca vitulina*), commonly can be seen basking on the lee side of some points. Because the offspring of the benthic, invertebrate species may spend periods of up to several weeks in the plankton, those from one rocky point undoubtedly arrive to settle down on another point far away. Thus, the community (fauna and flora) on a rocky point is not independent of that on other points, and for all the species to exist, it is essential that several separate communities coexist.

Recommendations: The various sets of rocky points on the County's shores have been treated separately on the several maps. Obviously, from what has been said above, the biological makeup of all rocky points should be maintained to ensure the protection of a given one.

Certain of the County's points (Conception, Arguello, Purisima), by virtue of their location on inaccessible property, are less disturbed than others. In fact, it is still possible to find Red Abalone *(Haliotis rufescens)* intertidally there. It is recommended that these already relatively undisturbed points continue to receive strict protection and be maintained as areas of scientific study.

Point Sal, Coal Oil Point, and Goleta Point, although more disturbed, all have unique characteristics. Point Sal, as well as being extremely scenic, displays some extremely well defined vertical zonation — an interesting biological characteristic. Coal Oil Point, among other things, possesses a remarkably rich intertidal invertebrate fauna. Goleta Point is an extremely fine example of the exposed rocky point, and among other things, supports a large population of the nemertean worm (*Emplectonema gracile*).

The biological uniqueness of these rocky points argues for special consideration of each. Each one offers marvelous recreation and educational potential. However, recreation usage should be kept light, and an effort should be made to educate the public as to the delicate and fragile nature of the intertidal. In general, rocky points will greatly improve if all but restricted scientific collecting is prohibited.

12. South Coast Intertidal Zone (5-1-1, 5-2-2, 5-2-3)

Location: The roughly 30 mile segment of the South Coast extending from Point Conception to Ellwood.

Biological comments: The criteria used in the formulation of this intertidal preserve included the following items.

— Relatively undisturbed nature of the coast. Almost half of the stretch is owned by private individuals, and access to the beaches consequently has been limited.

— Diversity of habitats available for study. Exposed rocks, semi-protected rocks, and exposed and semi-protected sandy beaches would all be included in the proposed preserve.

— The area is of great interest to biogeographers. As a result of the seaward movement of the relatively cold California Current south of Point Conception, a cold water biota is found north of

Point Conception, and a different warm water biota occurs south of the Point.

— The area provides a mainland study area analogous to the Channel Islands Scientific and Educational Preserve. At present, qualified study centers can gain access to the undisturbed intertidal zone on certain of the Channel Islands (Santa Cruz Island, Santa Rosa Island). Biologists know that comparisons between mainland and insular biotas can produce understanding of the basic interactions between communities, and between communities and their environments.

Recommendations: The intertidal zone is highly susceptible to human disturbance. Heavy recreational use of coastal areas results in habitat deterioration from collecting, food gathering, and traffic. In most areas, even relatively light recreational use is associated with the disappearance of certain organisms from the area. Realizing that we cannot completely justify the exclusion of persons from a 30 mile stretch of coast (even though at present such a policy applies to much of the area), we have designated some areas as suitable for light recreation use, and others as only suitable for scientific investigations.

Point Sal (Categories 10, 12, 40) (5-1-1, 5-2-3, 3-2-2)

Location: The northernmost major rocky point (and adjacent beaches, slopes, and chaparral) in Santa Barbara County.

Biological comments: Besides being of biological interest, Point Sal is one of the most picturesque points in the County. The collage of seascape, cliffs, and bluff vegetation is extremely handsome. Several distinct and well developed plant communities are present near Point Sal. One of the least disturbed patches of Coastal Sage (*Artemisia californica* and *Salvia* spp.) in the County exists above the steep slopes of the Point. Certain dominant members of this community (e.g. *Encelia californica*, a coastal sunflower) reach the northern limit of their ranges in the Point Sal area. Conversely, characteristic members of more northern floras (e.g. *Erigeron glaucus*), are present at Point Sal, where they reach the southern limit of their ranges. The steep slopes of the coastal bluffs near the Point support perhaps the best example of the limited coastal bluff plant community. Many mem-

bers of this community (e.g. Coreopsis gigantea) are limited in distribution, or can only be found on steep bluffs.

The species composition of the rocky intertidal at Point Sal also emphasizes the unique nature of the area. Portions of the fauna (Pisaster ochraceus, Mytilus californianus) represent unique opportunities for study of such basic biological interactions as competition and predation. Some of the mussels in the area may be fifty years old. It would be valuable to know, among other things, how they have escaped the numerous seastars. The zonation of the animals and plants in distinct horizontal bands at Point Sal is one of the clearest examples of this ecological phenomenon in the County.

Recommendations: Point Sal is an extremely interesting collection of several biotic communities. It retains much of its biological character because access to it is limited. However, the fact that abalones (Haliotis cracherodii and Haliotis rufesens) cannot be found in the intertidal attests to its present and past human use.

To insure preservation of the existing communities at Point Sal, we believe that the present amount of human use of the area should not be markedly increased. Apparently, a great deal of fishing and beach-combing presently occurs in the Point Sal area. Lifting boulders, bait gathering, and traffic are injurious to organisms, as well as the bluff vegetation, in or near the intertidal zone. Efforts should be made to educate recreational users about correct environmental procedures. The area is ideally suited for status as a "natural area with access permitted."

13. Naples Reef and Inshore Area (1-2-2 and 5-1-1)

Location: Intertidal and subtidal area, six miles north of Goleta, extending a mile or so to sea.

Biological comments: The total subtidal biomass and organismal diversity to be found at Naples is not exceeded anywhere else in the County. Algologists such as Dr. M. Neushul of UCSB believe that the diversity of benthic algae at Naples is the best on the South Coast. Invertebrate zoologists go to Naples to collect scientifically and to observe uncommon organisms (e.g. colonial anthozoans, phoronids, certain bryozoans, and dorid and aeolid nudibranchs). Icthyologists have found Moray Eel (Gymnothorax) only at Naples and one other

Santa Barbara locality. Striped Perch (Embiotica lateralis) is uncommon elsewhere, but is consistently found at Naples Reef. The Catalina Goby (Lythrypnus) can only be seen regularly near the Channel Islands and at Naples Reef.

Recommendations: Because of its unusual biological character, Naples Reef should be maintained primarily as a scientific research and educational area. The Local Coastal Program, in consultation with the California Department of Fish and Game, recommends that continued recreational use of this area be permitted and monitored to prevent depletion of marine resources.

13. KELP BEDS

Location: Subtidal areas along coast.

Biological comments:* Kelp beds are productive environments which serve as fish "nurseries" and thus are important to sport and commercial fishermen and biologists. These kelp beds are harvested regularly. Debate continues as to the effect harvesting may have on the kelp bed fish nursery function and on depletion of the kelp.

Recommendations: Specific studies should be undertaken to determine the effects of kelp harvesting and a management program should be developed to ensure continued productivity of the kelp beds.

20. Coastal Dunes (all 1-1-1)

Locations:

> Devereux Dunes, on the southwestern edge of the UCSB West Campus, Vandenberg Dunes, south of Purisima Point and north to Lions Head, Oso Flaco Dunes, north of Point Sal to the Santa Maria river, Surf Dunes, at edge of the estuary at Surf

Biological comments: Dunes with their associated biotas represent an extremely delicate and unstable environment. The sand constantly is in motion, and the only stabilization of the movement is derived from the relatively sparse, highly adapted vegetation. Any kind of travel over the dunes injures the vegetation, accelerates the movement of the sand, and thus produces environmental damage. The kinds of organisms living there are highly specialized to dunes, and in many instances are limited to them. Because dunes are invariably centers of intense human use, few of them remain in an undisturbed state. Consequently, many organisms characteristic of dunes are uncommon, rare, or endangered.

*Source: County of Santa Barbara-City of Carpinteria Local Coastal Program, Environmentally Sensitive Habitat Areas, November 1977.

Munz (1970) classifies dune and coastal strand as a distinct plant community, with the following dominant genera: Franseria chamissonis, Lupinus spp., Abronia spp., Oenothera cheiranthifolia, Fragaria chiloensis, Mesembryanthemum spp., etc. He also notes that many plant species do not extend past Point Conception, from either the north or south. Thus the dunes of Santa Barbara County are especially interesting because of their special and distinct floristic makeup on either side of Point Conception. The California Native Plant Society (1971) lists three species (Cirsium rhothophilum, Corethrogyne leucophylla, and Senecio blochmanae) as rare or endangered and limited to dunes and coastal strand. For example, the type locality (that in which the species was first described) for Cirsium rhothophilum is the Surf dune area.

Recommendations: Because of their extremely delicate nature, dunes should be protected from all but certain scientific and educational uses (portions of the Guadalupe Dunes north of the Santa Maria River, already badly scarred by ORV use, excepted). The Vandenberg Dunes should be protected from military traffic. Ocean Beach County Park at the mouth of the Santa Ynez River should not be expanded. The dune area surrounding the park should be placed in a "preserve" status. The Regents of the University of California should be commended for their inclusion of the Devereux Dunes (under "preserve" status) in the Natural Land and Water Reserve System of the University. The other dunes in the County could be treated in a similar fashion.

34. Sloughs and Closed Bays

Goleta Slough (7-2-2) — An estuary is a tidally affected marshland which receives nutrients from freshwater runoff. Goleta Slough is one of perhaps ten estuaries on the California coast that still are in moderately good biological health. As a habitat (which includes mudflats, tidal channels, and channel bank microhabitats), the Goleta Slough supports a larger and more diverse fauna and flora than does any of the other three sloughs or closed bays in the County (Surf, Devereux, and Carpinteria). It is a major resting point for migratory water-fowl using the Pacific Flyway, with approximately 26 resident bird species and several more nesting summer species. The Black Rail, the light-footed Clapper Rail, and the Belding's Race of the Savanna Sparrow, all rare and endangered birds (California Fish and Game, 1974), may be among the resident species. The Slough's

diverse avifauna is documented by observations of the Santa Barbara Audubon Society whose members regularly see rare birds in the area (e.g. Roseate Spoonbill). Although the slough now covers only 360 acres, racoons, white-tailed kites, herons, bitterns, egrets, and a pair of grey foxes still can be found in relatively undisturbed areas.

The vegetation found in Goleta Slough is characteristic of and limited to coastal salt marshes and estuaries. Munz (1970) describes the coastal salt marsh as comprising a distinct plant community, typified by such genera as *Salicornia*, *Suaeda*, *Distichlis*, *Spartina*, *Limonium*, *Frankenia*, and *Cordylanthus maritimus*, a rare and endangered plant (California Native Plant Society, 1971). In addition, the slough is floristically enriched by numerous non-slough species.

The presence of certain species of fish and invertebrates further attests to the biological uniqueness of the Goleta Slough. *Gillichthys mirabilis*, *Fundulus parvipinnis*, and *Platichthys stellatus*, although not uncommon species, are limited to coastal estuaries. *Hemigrapsus oregonensis*, certain gammarid amphipods, *Assiminea californica*, *Melampus olivaceus*, *Cerithidea californica*, and numerous other invertebrates can only be found in the mud flats of sloughs and coastal salt marshes. Some of the latter species reach the northernmost limits of their range in the Santa Barbara Area.

In the Goleta Slough is a representative of a unique and increasingly rare type of habitat — the coastal salt marsh and estuary. Similar habitats in Orange, San Diego, and Los Angeles Counties have long since fallen to development. The slough supports a large and highly diverse flora and fauna, some elements of which are limited to estuaries and sloughs.

Recognized Rare and Endangered Species:

- *Cordylanthus maritimus*
- Black Rail — resident (?)
- Belding's Race of Savanna Sparrow — summer visitor
- California Least Tern — summer visitor
- Light-footed Clapper Rail — resident (?)

Devereux Slough (7-2-2) — This small estuary located on the western portion of the UCSB West Campus is quite similar to the Goleta Slough. In addition, the Devereux Slough is close to a stretch of

coastal dune. Uncommon, secretive (e.g. Aniella pulchra, a legless lizard), and rare and endangered organisms characteristic of coastal dunes may be located at the edge of the Devereux Slough. The same rare and endangered species found in the Goleta Slough also are found in the Devereux Slough, except for the Clapper Rail.

Carpinteria (Sandyland) Slough (7-2-2) — Many of the comments on the Goleta Slough also apply to the Carpinteria Slough. In addition, it is possible that this slough is less disturbed than the Goleta Slough. Like the Goleta Slough, it represents an "oasis" for migrating waterfowl. Similarly, it supports a large and, in many respects, unique biota, including all five rare and endangered species sighted in the Goleta Slough.

Recommendations on the Goleta, Devereux, and Carpinteria Sloughs: Estuaries are delicate habitats that require tidal flushing and nutrient input from freshwater runoff to retain their productivity. Clearly, any tampering with either the marine or freshwater inputs decreases this productivity and, therefore, the biota. Traffic should be minimized, and no reduction in the size of the sloughs should be contemplated.

Mosquito abatement activities in these areas probably severely interfere locally with the other biota, especially the invertebrate fauna. These invertebrates are fundamental in maintaining a diverse slough community; therefore such abatement activity imposes a cost in terms of loss of local diversity. Other potential costs of abatement include the removal of natural checks on the mosquitoes and, where pesticides are used, the increased probability of the mosquitoes' developing resistance to insecticides. Resistance could pose a serious problem in the future if a mosquito-transmitted disease developed. These immediate and potential future costs must be balanced against the benefit of the reduction of nuisance mosquitoes. Unfortunately, not enough is known about the relationship between the local density of mosquito larvae in parts of the slough and the amount of nuisance that is created by biting adults; it may well be that quite high densities of mosquito larvae can be tolerated before a severe nuisance is created. We recommend that the Mosquito Abatement District actively seek to reduce control activities to the minimum level needed to prevent severe nuisance levels of mosquitoes. Some effort should also be made to educate the public to the fact that the disadvantage of a few, infrequent mosquito bites is to be balanced against the maintenance of diverse

ecological communities in several selected areas such as these sloughs.

Present scientific and education use of sloughs (and the potentially enormous future use) should be regulated and limited to serious investigations and teaching. Recreation usage likewise should be limited and should be restricted to the boundaries of the areas.

Surf Area including Ocean Beach Park (Categories 20, 34, 80) (all 4-2-2)

Location: Salt marsh, small fresh water marsh, and dune area immediately on and surrounding Ocean Beach State Park.

Biological comments: The Surf salt marsh and adjacent area (including dune and freshwater marsh) are of great interest to biologists. The salt marsh, like the other three sloughs in the County, is an oasis for migratory waterfowl using the Pacific Flyway. The marsh also is a distinct plant community (characteristic genera include *Salicornia*, *Suaeda*, *Distichlis*, *Frankenia*, etc.) which provides habitat for numerous animals. Among the birds afforded suitable habitat by the coastal salt marsh are the endangered summer visitor, Belding's Race of the Savanna Sparrow, and the rare resident Black Rail (California Department of Fish and Game, 1974). The endangered plant *Cordylanthus maritimus* also is found in coastal salt marsh (California Native Plant Society, 1971). The dunes and coastal strand surrounding the Surf salt marsh are of great interest to the botanist. *Cirsium rhothophilum*, an endangered plant (California Native Plant Society, 1971), was first collected and described in the dunes of Surf (Munz, 1970). These dunes also contain the southernmost populations of certain coastal strand dominants (e.g. Evening-Primrose (*Oenothera cheiranthifolia*) and Sand-Verbena (*Abronia latifolia*) (Munz, 1970).

As the Santa Ynez River feeds the area, its rate of flow is decreased and small pockets of freshwater marsh are formed. Different plants (*Scirpus* and *Typha*) and animals (several amphibians) can be found in these regions where they are extremely close to the more saline slough. Finally, the sandy beach at the mouth of the Santa Ynez River is the only spot in the County where the endangered California Least Tern has recently nested. These birds used to nest in large groups on several beaches in the South Coast area, but are usually now seen as migrants (Metcalf, 1972).

Recognized Rare and Endangered Species

Black Rail — resident (?)
California Least Tern — summer visitor
Savanna Sparrow — summer visitor
Cirsium rhothophilum — dune
Cordylanthus maritimus — salt marsh

Recommendations: Quite obviously, the several habitats found at Surf provide a unique assemblage of biotic communities that is not found anywhere else in the County. As all of these communities (habitats) are delicate, they cannot tolerate heavy use of any kind. The rather small County park at Surf should not be expanded, and ORV's should not be allowed on the dunes. Likewise, traffic in the marshes should not be allowed.

40-49. Chaparral and Scrub Habitats: Preserves and Study Areas

Locations:

Mixed Chaparral surrounding San Marcos Pass (7-2-2)
Dwarf Chaparral adjoining the Purisima Hills (7-2-2)
Adenostoma-dominated Chaparral on Refugio Pass Road (3-2-2)
Coastal Sage near Point Sal (3-2-2)
Serpentine Chaparral near Figueroa Mountain (5-2-2)
Montane Chaparral near Cachuma Mountain (3-2-3)

Biological comments: Some of the so-called chaparral habitats are very well represented in Santa Barbara County. Several botanists and authors cite the San Marcos Pass area as a prime example of the Mixed Chaparral habitat. Where Chamise (Adenostoma fasciculatum) dominates the chaparral, some botanists see it as a distinct plant community; a prime example exists on the south-facing slope of Refugio Pass.

Coastal Sage, a plant community dominated by Artemisia californica, and species of Salvia (True Sage), is restricted to the South Coast Ranges, and is usually found below 3,000 feet. The Point Sal area contains a prime example of this plant community.

On the south side of the Purisima Hills, climatic and soil conditions provide a unique and interesting biological event — a Dwarf Chaparral

community. Clearly, such communities, widely scattered throughout the state, are of extreme biological interest.

When chaparral occurs on serpentine (a rock type which does not support many species of plants), its floristic makeup is altered. Some chaparral indicator species are not found, and the community is floristically enriched by certain plants which only grow (or are usually found) on serpentine. Serpentine Chaparral, therefore, is an extremely interesting plant community.

Characteristic lowland genera (primarily *Ceanothus*, and *Arctostaphylos*) persist in the Montane Chaparral, but the species composition of this high altitude plant community is quite different. The community is found in portions of Santa Barbara County, but is more characteristic of areas with higher elevations. Montane Chaparral, for example, can be found at 9,000 feet in the Sierra Nevada of California.

Recommendations: To insure the preservation of all species associated with the variety of chaparral and scrub habitat in the County, it will be necessary to restrict use of several areas. In undisturbed areas, productive educational and research programs could be conducted. We recommend low-use chaparral preserves to perpetuate the present high diversity of habitats and communities to be found in the County.

43 & 70. Chaparral and Coastal Pine in the Western Santa Ynez Mountains (4-2-2 and 1-2-2)

Location: Slopes of the western Santa Ynez Mountains, principally between Point Conception and Gaviota Pass.

Biological comments: This relatively undisturbed area, consisting of much of the old Hollister Ranch, is of biological interest for several reasons.- Several of the canyon edges, by virtue of cool ocean breezes and fog, support groups of Bishop Pine (*Pinus muricata*). Closed cone pines, a group to which the Bishop Pine belongs, are uncommon and local in the statewide distributions; so efforts should be made to preserve existing stands. The endangered Yerba Santa (*Eriodictyon capitatum*), found only in Santa Barbara County, is to be found scattered about the area; and, according to Munz (1970), is closely associated with closed cone pine forests. The area also is extremely sce-

nic. The train ride on the coastal edge of the area offers views of spring wildflower displays, wooded canyons, and graceful oaks.

Recommendations: The presence of Pinus muricata and Eriodictyon capitatum argues strongly for preservation of large portions of the area. To best preserve the "untouched" beauty of the area, recreation usage should be light, and grazing cattle should be prohibited in the Pine-Yerba Santa community.

Grassland

50. Natural Grasslands (all 5-1-1)

Locations:

- An approximately 9 acre patch on Las Tunas Road in the City of Santa Barbara
- A small patch on the coast bluffs west of Ellwood Pier
- Isolated patches on Camino Cielo West (Santa Ynez Ridge)

Biological comments: Prior to the arrival of the Spanish, who introduced herds of grazing animals and brought other grasses with them, much of the state was native grassland. However, with grazing, native grasses started to disappear as European grasses became established. The resulting competiton has, in many areas, forced California native grasses to the verge of extinction. The California Native Plant Society lists 26 grass species as either rare, endangered, or possibly extinct. The grass family (Poaceae) ranks fifth on this society's endangered list.

Recommendations: Because of the rarity of native grasses, areas where they occur should be preserved. It is recommended that these areas should be subjected only to carefully regulated scientific study.

51. Introduced Grasses

More Mesa Grasslands (7-1-1)

Location: Approximately one square mile of bluff-top west of Hope Ranch and abutting the beach.

Biological comments: The More Mesa Grassland according to one

authority on the White-tailed Kite, is the most important area in which this bird feeds and roosts on the South Coast. Contributing to the success of this uncommon species on the mesa are the ungrazed grasses which support large populations of California Meadow Mouse (Microtus californicus), the chief food-item of the kite.

Recommendations: It is our opinion that the California Department of Fish and Game has prematurely removed the White-tailed Kite from its list of rare and endangered species. The range of the kite is small, and the bird is specialized in both its prey and habitat preferences. The deep grasses on More Mesa support numerous meadow mice; grazing or other damage to the grass will drastically reduce the number of mice, thus affecting the kite population. If light recreation use is to be permitted, trails should be established to minimize disturbance to the grasses. Obviously, very light recreation should be the only use contemplated for the More Mesa Grasslands.

Santa Maria Grassland as a Habitat for the Spadefoot Toad (8-2-3)

Locations: One habitat is two to three miles west of Santa Maria (on Betteravia Road), and the other is approximately one mile east of Santa Maria.

Biological comments: The Santa Maria area may be the only area in the County which provides suitable habitat for Western Spadefoot Toad (Scaphiopus hammondi) (Stebbins, 1962). These unusual amphibians, which spend most of the year in self-constructed burrows, come to the surface during the wet months to breed in temporary pools of water. They are most abundant in areas of short grass with sandy or gravelly soil.

Recommendations: Spadefoot toads are becoming extremely uncommon in areas where they were once abundant and widespread. It is not unrealistic to believe that some or all of the five species of North American Spadefoot Toads, since they are secretive and their abundances and distributions are incompletely known, are becoming rare or even endangered. Except when breeding, they seem to be tolerant of moderate disturbance; and as long as disturbance to the soil is minimized, the Santa Maria Grassland can support various kinds of recreation.

Woodland and Savanna

60. Central Oak Savanna (8-2-2, 8-2-3, 8-2-4)

Location: A fairly large area of the central Santa Ynez Valley, from east of Lake Cachuma to north and west of the town of Santa Ynez.

Biological comments: This plant community, dominated by the stately deciduous Valley Oak (*Quercus lobata*), is an area of great scenic potential. In spring the wildflower display is breathtaking, with fields of poppies, lupines, and fiddlenecks spreading in all directions. Where not overgrazed, the community supports a diverse fauna, including Bobcat (*Lynx rufus*), Mule Deer (*Odocoileus hemionus*), and occasional bear or mountain lion. Scrub jays, acorn woodpeckers, and yellow-billed magpies are typical of the colorful avifauna. An interesting fauna of amphibians and reptiles (*Clemmys marmorata*, *Thamnophis spp.*, *Bufo boreas*, *Rana spp.*, etc.) occurs in the region, especially near the Santa Ynez River. Where relatively well managed, portions of the area (Santa Ynez Indian Reservation) support a reproducing population of the uncommon White-tailed Kite, an important resource for scientific research.

Recommendations: Although at present an area of extreme beauty, the Valley Oak Savanna is in danger of rather rapid destruction. Much of the valley is ranch land, and the cattle graze and kill the seedling oaks. The available evidence strongly suggests that oak regeneration in the valley is very sparse, much less than is needed to replace mature oaks as they die. Thus, if present conditions persist, the oaks will gradually disappear from most of the valley. We recommend that a study be made of regeneration in the valley and the effects of cattle grazing. We also recommend that, on the basis of the information obtained, an overall management plan for the valley be drawn up which would protect seedlings on a scale large enough to maintain the savanna oak community in its present status. In addition, special treatment should be given to the bottomland south of Santa Ynez. This area supports a rather large population of White-tailed Kites. Destruction of the Oak Woodland habitat in this portion of the Santa Ynez Valley will result in a rapid decline in the number of birds in the area.

60. Santa Ynez Valley Canyon Communities (8-2-3)

Location: Several canyons immediately north of Lake Cachuma, Santa Ynez Valley.

Happy Canyon (including De La Guerra Spring)
Cachuma Creek Canyon
Santa Cruz Creek Canyon

Biological comments: These canyons, by virtue of the temporary streams running through them, are a somewhat wetter habitat than the surrounding Valley Oak Savanna. The spring wildflower display may be more diverse in these canyons than in any other Santa Barbara locality. An equally diverse fauna is supported by the numerous microhabitats present in each of these canyons. In addition, Happy Canyon abuts against the De La Guerra Spring area, a serpentine soil locality of extreme interest to biologists because of the selective inhibitory effects on plant growth.

Recommendations: These representatives of the valley canyon community should be protected from unregulated and haphazard development. Roads should be kept narrow. The total number of cattle should be regulated, for overgrazing destroys any area. Light grazing, however, is not incompatible with the beauty of some scenic resources. By reducing the total quantity of grass, cattle actually may make flowers more abundant and obvious.

61. Southern Oak Woodland - Rincon Creek (5-2-2)

Location: Extremely small patches of this community persist in the South Coast area, with the only known stand of Juglans californica on the South Coast area growing along Rincon Creek (Griffin and Critchfield, 1972). This patch of Southern Oak Woodland represents a rare plant community that is of scientific value.

Biological comments: Munz (1970) defines this plant community as consisting of the following dominant species: *Quercus agrifolia*, *Quercus engelmanni*, *Juglans californica*, *Rhus integrifolia*, *Rhus ovata*, and *Rhus trilobata*.

Recommendations: Urbanization, expansion of agriculture, and certain kinds of recreation should not be allowed in the area. Campers, who tend to remove lower tree-limbs, glean, and trample also should be excluded.

64. Foothill Woodland (4-2-3, 8-2-3)

Location: A large area bordered on the west by Wheat Peak and Range Peak, and on the east by Santa Cruz Guard Station and the Sisquoc Falls. The area represents the major distribution of Digger Pine (*Pinus sabiniana*) in Santa Barbara County. In the County, the Digger Pine is near the southern extreme of its range, the southernmost

population being on Pine Creek in Ventura County (Griffin and Critchfield, 1972).

Biological comments: The Pinus sabiniana woodland is another example of a community which is much better represented in the northern part of the state. (Pinus sabiniana is endemic to California.) In general, wooded resources are uncommon in the County, and although the Digger Pine rarely forms forest, it does form rather handsome woodlands in some areas. Accordingly, careful consideration should be given to preservation of this woodland. Besides providing valuable habitat for numerous animals, Pinus sabiniana woodland is extremely valuable as a scenic resource.

Recommendations: Development of this area should be stopped, and further road construction should be prevented. However, moderate recreational use would be tolerated by the community.

Forest Habitats

65. Canyon Oak — Bigcone Spruce (5-2-2)

Location: Juncal area of the upper portion of Santa Ynez River. This area lies approximately five to six miles north of Carpinteria on the north slope of the Santa Ynez Mountains.

Biological comments: These steep north-facing slopes provide the climatological requirements of rather large stands of Bigcone Spruce (Pseudotsuga macrocarpa). Cliff Smith of the Santa Barbara Museum of Natural History regards the area as one of the prime examples of the Canyon Oak - Bigcone Spruce plant community to be found anywhere in the County. Another prime example, and perhaps the largest stand of the spruce in the County, occurs on the north slope of Ranger Peak, east of Figueroa Mountain.

Recommendations: These areas should be treated as prime examples of a relatively rare plant community. Animals living in the area include such uncommon species as Mountain Lion (Felis concolor), Ring-tailed Cat (Bassariscus astutus), Mountain Kingsnake (Lampropeltis zonata), and California Lyre Snake (Trimorphodon vandenburghi). Clearly, the localities support a varied, unusual, and scenic biota. As such, they should be protected from development and heavy recreation.

66. Coast Live Oak Forests (7-2-2)

Location and biological comments: These areas, where undisturbed, are composed of closely spaced trees of Coast Live Oak (Quercus agrifolia). The stands on Miramonte Hill, west of downtown Santa Barbara, are among the best examples of this plant community in the County. Immediately adjacent to these stands of Coast Live Oak are equally undisturbed areas of Coastal Sagebrush (Artemisia californica) and Mixed Chaparral. Native wildflowers form a good display in the spring. Larger stands also occur in the canyons of the Santa Ynez Mountains, especially near the Refugio Pass area.

Recommendations: Urbanization, expansion of agriculture, and moderate to heavy recreation should not be allowed in these areas. A "natural park" that could tolerate the lighter types of recreation would be desirable.

69. Mixed Evergreen Forest

Locations:

Painted Cave Area (5-2-2)
Kinevan Canyon Area (5-2-2)
Jualachichi Summit on Jalama Road (5-2-2)
North slope of Tranquillon Mountain (5-2-2)
Several other mapped localities on north slope of Santa Ynez Range between Gaviota Pass and Dos Pueblos Creek drainage (5-2-2)

Biological comments: Munz (1970) characterizes this plant community as lying "along inner edge of the redwood forest and on higher hills within it, mostly in the North Coast Ranges....". Plants associated with the community include Tanbark Oak (Lithocarpus densiflora), Madrone (Arbutus menziesii), California Bay (Umbellularia californica) and Bigleaf Maple (Acer macrophyllum). The Mixed Evergreen community, where it exists in the County, represents the persistence of a plant community that was more widely distributed when the climate was wetter and cooler. Animals associated with the community represent a diverse assemblage. Some of the species are found elsewhere in the County, but others, like the plants, are species that require cool, damp conditions (e.g. Ensatina eschscholtzi) and are abundant only further north.

Recommendations: Disturbance of the community should be minimized. Roads in the area should not be widened, and further development should be curtailed. These "islands" of vegetation are of tremendous scientific, educational, scenic, and light recreational value.

69-70. Jualachichi Summit (5-2-2, 4-2-2)

Location: A small (one quarter square mile) area southeast of the sharp turn at the Jualachichi Summit, six air miles from Jalama Ranch and slightly off Jalama Road.

Biological comments: This small area is of extreme botanical interest, and represents an "island" of north-coast vegetation in a "sea" of chaparral and grassland. A small stand of Bishop Pine (*Pinus muricata*) is surrounded by Mixed Evergreen elements (*Lithocarpus densiflora*, *Vaccinium ovatum*, *Myrica californica*, etc.). It is believed that the cool ocean breezes and fog contribute to the persistence of this small community. Pockets of native grasses, now quite rare, also grow where fine, sandy soil exists. The surrounding rocky soil supports a well-developed chaparral community, and on the south-facing slopes the rare and endangered Refugio Manzanita (*Arctostaphylos refugioensis*) is found. A handsome wildflower display also can be seen in this area including the uncommon Chocolate Lily (*Fritilaria bicolor*).

Recommendations: Widening of Jalama Road in the Jualachichi Summit area must not be contemplated. Destruction of the north-facing slopes in this small area will eliminate this interesting community. Grazing should be limited to areas well away from the summit. The presence of such an unusual community, as well as an endangered plant, calls for sensitive planning in this unusual and delicate area.

70-71. Purisima Hills (4-2-2, 1-1-1)

Location: A rather large elevated land mass, lying directly north of Lompoc and fifteen miles south of Santa Maria. The total area consists of about 25 square miles.

Biological comments: The Purisima Hills are of very great interest the botanist. Located near the summit of Harris Grade on Highway 1 is one of the most extensive stands of Bishop Pine (*Pinus muricata*)

to be found in the County, along with the endangered closed cone pine associate, Yerba Santa (Eriodictyon capitatum). Without doubt, however, of greatest biological interest in the Purisima Hills is a small group of Douglas Fir (Pseudotsuga menziesii). Some twenty trees, growing on nutrient-poor diatomaceous shale, lie within a group of Bishop Pine. The firs represent a relictual population of a tree common to cooler, wetter climates (Northern California to Canada). The next nearest group of Douglas Fir lies 85 air miles to the north. The lack of competition from other trees due to the poor soil and the coolness of the area in all likelihood contribute to the survival of these few trees.

Recommendations: Obviously, the occurrence together of an uncommon pine, a relict tree, and an endangered species justifies complete preservation of the area. Widening of the roads at the expense of the pines would be extremely unfortunate. The firs should be regarded as inviolate. Even trails through the area would accelerate erosion, and thus endanger the population.

74. Coulter Pine Forest

Forests containing this species occur in several places in the County.

Ridge of Santa Ynez Mountains

Locations:

- La Cumbre Peak (5-2-2)
- Santa Ynez Peak (4-2-4)
- Ridge between Refugio Pass and Santa Ynez Peak (5-2-2)

Biological comments: The crest of the Santa Ynez mountains provides a unique South Coast habitat. Marine and valley climatic influences help produce this ecotone. Among other things, Coulter Pine (Pinus coulteri) is found only at these three localities in the Santa Ynez Mountains. An indication of the biological uniqueness of the ridgetop habitat is the uncommon organisms associated with it. Two rare and endangered plants (Thermopsis macrophylla, and Arctostaphylos refugioensis) occur at the crest of the Santa Ynez Range. Thermopsis occurs on the slopes of Santa Ynez Peak, and the Arctostaphylos grows on the crest near Refugio Pass. The latter appears again at Jualachichi Summit on the Jalama Road, and probably occurs between the two localities.

Recommendations: Because of the limited size of these unique areas on the Santa Ynez Crest, an effort should be made to minimize disturbance to the habitat. The spraying of herbicide on the ridge should be curtailed. The U.S. Forest Service has banned ORV's from the area.

Miranda Pine Mountain and Associated Upland Area (1-2-3)

Location: Slopes and peaks of northern portions of the Sierra Madre Mountains in the County.

Biological comments: The chaparral occurring in this area is reminiscent of the same community 150 miles to the east in Riverside and Los Angeles Counties. A species occurring in the Sierra Madre but uncommon in the rest of the County is Ribbonwood (*Adenostoma sparsifolium*). Coulter Pines (*Pinus coulteri*), uncommon on the coast, are well represented in this portion of the Sierra Madre Range. Incense Cedar (*Calocedrus decurrens*) also might occur in a few canyons of this part of the County. (It is known to occur farther east.) Some of the canyons in the area offer suitable habitat for certain mesic forms. The striking sword fern *Polystichum* can be found in Bates Canyon.

Recommendations: This portion of the Sierra Madre supports a diverse and local series of communities. It is of interest to the biogeographer because of the floristic parallels that exist between this area and more southerly portions of the state. It also provides the kinds of habitat suitable for use by the endangered California Condor. Road building should be curtailed in the area, and further development should be prohibited. The area is ideally suited to outdoorsmen interested in light recreational activities.

Riparian Forests and Woodlands

75 Nojoqui Falls Park (6-2-2)

Location: A small park with falls and stream, approximately 1.7 miles east of Highway 101 between Solvang and Gaviota.

Biological comments: This riparian community, continuing some distance below the falls, is one of the few continuously damp and cool communities in the County. The luxurious growth of Liverworts

Marchantia) and Maidenhair Ferns (Adiantum jordani) on and near the falls is probably unparalleled in the County. For the past several years a Spotted Owl, a bird regarded as "threatened" by the National Wildlife Federation, has roosted in the thick stand of California Bay (Umbellularia californica) along Nojoqui Creek.

The Middle Gaviota Formation, on which Nojoqui Falls and Creek lie, is a rich fossil bearing formation according to Dr. R. Norris. Certain molluscs including the snail Turritella variata, an indicator species of a particular fossil fauna, are abundant.

Recommendations: This extremely beautiful area has great biological and recreational potential. Expansion of the park facilities in the direction of the falls should not be contemplated. The ferns (originally uncommon, and now as a result of County-wide collection, rare) and the fossil beds should be carefully protected from collectors. As a consequence, recreational use of the creek near the falls should be limited to the trail.

76. Trees Serving as Traditional Roosting Sites (5-2-2)

Locations:

- Three trees (Cypress, Eucalyptus, and Pine) near the parking lot of the Music Academy of the West
- A group of Eucalyptus trees near the headquarters of the Dos Pueblos Ranch
- A group of Eucalyptus trees on the southwest end of Coronado Drive in Goleta
- Turkey Vulture summer roost in Eucalyptus on San Jose Creek north of Highway 101

Biological comments: "Butterfly trees" are used by massive numbers of the Monarch Butterfly (Danaeus plexippus) as communal roosts during the fall and winter months. After this period the animals disperse, but return to the localities again for the same period the next year. The benefits derived by the organisms from the roosting behavior are not completely understood, but the behavior obviously is essential to their survival.

Turkey Vultures are large carrion-eating birds which are residents of Santa Barbara County. The number of birds in the County dra-

matically swells when vultures which have wintered elsewhere return. It is in the late spring, summer, and early fall months that large numbers of vultures congregate at communal roosts. The row of Eucalyptus on the west bank of San Jose Creek, just north of Highway 101, has been an active roost for approximately 35 years.

Recommendations: The roosting behavior and the dispersion of the Monarch Butterflies in the spring is of extreme scientific interest. Quite obviously, the roosts also are unusual "habitats", of educational value as well as of general public interest. The roosts tolerate some disturbance but should not be subjected to intense development. It is essential that a zone about 100 feet wide surrounds each area. Protection of the Turkey Vulture roost in Goleta should be similar to that given to the Butterfly Trees.

80. Freshwater Marsh (5-2-2)

Freshwater marshes, an extremely uncommon habitat in the County, are well exemplified by the small area near the Goleta Sanitary District Plant, east of the Santa Barbara Airport Terminal. Portions of the Santa Ynez River and a small portion of the Surf Lagoon also are marsh, but these areas are discussed separately. Other small marshes exist like islands, scattered along the coast and the major rivers. The plant community is characterized by the following dominant genera (Munz, 1970): Scirpus, Typha, and Carex. Animals associated with freshwater marshes are waterfowl (Ducks, Geese, Rails, Blackbirds, Bitterns, etc.), certain rodents, frogs, and aquatic reptiles (e.g. Thamnophis couchi). Most members of the freshwater marsh community cannot tolerate a reduction of water quality or quantity. The marsh areas are suitable for light recreation, but should be protected from other uses.

Aquatic Freshwater Communities

90 & 92. Streams (6-2-3, 6-2-2, 2-2-2, 1-2-2)

All the streams of the County are delicate habitats because even a cursory survey indicates that their character is changed greatly, generally to a less desirable condition, by any development of the riparian land. Highway or road construction, housing development, orchards, and even grazing at the intensity that is typical locally profoundly affect the streams. Some undesirable effects are the increased

erosion of banks, increased siltation in slower reaches, more abundant growths of algae, higher water temperatures, loss of fish from the community, and decreased diversity among the invertebrates (insects, worms, crustaceans, etc.) of the biological community. It is easy to understand how these changes detract considerably from the aesthetic value of the streams and the lands bordering them. Other potential problems may not be so apparent. Decay of abundant algal growths at high summer water temperatures may result in unpleasant odors, and in swarms of nuisance insects which breed in the decaying algae. The changes in composition of the insect fauna likewise may result in insect nuisance problems. We have observations, though they have not been tested in any quantitative fashion, that blackfly or buffalo gnat (Simuliidae) larvae become more abundant in those streams heavily influenced by people in the Santa Barbara area. The adults of these flies are serious nuisances, delivering bites which are painful to many people and serving as vectors of several livestock diseases. Although we know of no such disease problems in the County at present, continued destruction of streams may create them in the future.

Protection of stream habitats, enhancing their aesthetic value and avoiding serious problems of the sort just discussed, need not involve any substantial economic burden. Preservation of strips of riparian land, with intact communities of native vegetation analogous to the "buffer strips" now left by many enlightened logging operations, can serve to insulate the stream habitats from many of the insults of human activities. The vegetation, particularly its root systems and associated humus, can serve as a sponge to absorb runoff coming from developed lands in the watershed during times of heavy precipitation. Release of this moisture in drier seasons will serve to dampen fluctuations in streamflow. At the same time, these buffer strips will catch much of the silt carried by the runoff, and catch and bind quantities of important nutrients, such as phosphorus, that otherwise will contribute to excessive fertilization of the stream. Buffer strips should not, of course, be open to grazing; and establishment of these areas would put an end to the slipping, slumping, and erosion of soils commonly caused by the removal of vegetation and the constant pressure of animal traffic on steep slopes along the streams.

Pesticides should not be used on buffer strips except under very exceptional circumstances. On the other hand, soils of the strip may bind certain categories of pesticides which enter in runoff from developed lands. This binding action will delay or prevent the influ-

ence of pesticides upon stream communities and, perhaps, also upon marine communities which receive the stream waters.

A number of streams of the area serve as sewers, receiving septic and nutrient-rich waters from poorly designed septic tank drain fields. In several situations it appears that drain fields are, in fact, non-existent, and the stream receives extremely septic wastes from a pipe presumably connected directly to the sewage system of a dwelling. Establishment and inspection of buffer strips logically could involve correction of these situations.

We do not know how wide buffer strips would have to be to have a substantially beneficial effect with respect to these various objectives. The effectiveness of buffer strips of various widths in protecting streams from logging activities currently is under study (by Dr. D. C. Erman of the University of California, Berkeley, supported by the Water Resources Center), and results of these studies may have some relevance to the situations under consideration here. Obviously, the wider the strip the greater the degree of protection afforded, but full protection may be economically unfeasible. We estimate that as little as 100 feet on either side of a stream could provide a good deal of protection to the stream, although this width would have to be increased where the slope of the land is significant.

Other indirect benefits of buffer strips probably are obvious. These bands of native vegetation traversing a community would provide an aesthetically pleasing backdrop. They could provide areas for rest, relaxation, and nature appreciation. Foot trails, limited picnic facilities, and where the slope is not great, equestrian paths would not interfere greatly with their primary purposes.

Stream Protection Criteria: Streams deserving greater protection than that afforded to those simply classified as delicate habitats include Rattlesnake, Dos Pueblos, Tajiguas, Arroyo Hondo, Refugio, Jalama, Mission above the 250 foot elevation, San Roque above Foothill Road, and San Jose above the U.S.G.S. gaging station at about the 100 foot elevation. In selecting these streams for preservation as scientific study areas, and for protection from human activites other than very light recreation, we considered several factors. Of primary importance was the degree to which the habitat and the aquatic biotic communities already have been altered by human activities. It is important to preserve some communities and habitats that approximate, as nearly as

possible, their natural condition. Second, we chose streams that already are substantially protected because their upper reaches lying in Los Padres National Forest are immune to intensive development. In this way, preservation of representative native habitats can be obtained at minimal additional cost and inconvenience to the public. Third, we felt it important to afford full protection to the upper and middle reaches of some of the streams which, at lower elevations, run through centers of urban development. Two lines of reasoning underlie this decision. Because these areas are close to the city, they provide a place where people conveniently can enjoy some of their natural heritage and where amateur and professional scientists can make observations, although, of course, such activities should be non-destructive. Second, the waters of these creeks, upon reaching the urban areas, will be of the highest attainable quality, thus making it easier to maintain water quality as the stream flows through the community and helping to avert problems stemming from nuisance-level growths of algae and abundant noxious aquatic insects.

Besides providing habitat for strictly aquatic forms, streams also provide habitat for creatures only partially dependent on water. For example, Stebbins (1966) when commenting on the habitat preferences of the uncommon California Mountain Kingsnake says "Search for it in the vicinity of well-illuminated rocky streams in wooded areas..." Numerous other terrestrial or amphibious vertebrates are most abundant near streams. Some roost there, others forage there, and still others return to these areas to reproduce. Thus, streams cannot be thought of as only providing habitat for purely aquatic forms. Nor is it biologically sound to regard the immediate streambed as the extent of the community. In most instances, the stream community extends far into the adjacent watershed.

<u>Biological comments on individual streams</u>: Rattlesnake, Mission and San Roque Creeks have their headwaters in Los Padres National Forest. Until they flow on to private land, they have aquatic biological communities that probably are quite similar to their original biota. Protection of the lower reaches undoubtedly would permit recuperation of the biotic communities in these areas. Rattlesnake Creek and Mission Creek, with the combined flow of Rattlesnake below Foothill Road, supported the reproduction of migratory sea-run rainbow ("steelhead") trout within the recent past. Because these streams only recently have become degraded, the trout populations could be reestablished in the future. Mission Creek flows through the Santa

Barbara Botanic Garden, a collection of native California plant assemblages. To maintain the Garden's aesthetic and scientific value, the creek must be protected from further influences of grazing, septic tank leachate, and other human activities that now affect it.

San Jose Creek has its origin and runs for a considerable distance in the National Forest. The creek is used as a study area by University of California classes and research investigators, and is of considerable interest because of altitudinal variations in water chemistry and aquatic biota. A long stretch of the stream supports a highly varied aquatic fauna including large populations of the amphibious salamander (Taricha torosa) and rainbow trout (Salmo gairdneri). The stream retains its desirable natural qualities for some distance after flowing onto privately owned lands, probably because of the steep, rugged terrain of its canyon, which discourages many human activities, and due to the fact that local residents along the waterway appreciate its relatively undisturbed state. Water is piped from the stream for domestic or agricultural purposes, detracting from the creek's naturalness and its value as a scientific study area. However, this is a relatively easy matter to correct. Avocado ranching along the lower reaches probably has increased siltation, and caused algal growth and bank erosion. Efforts should be made to minimize the effects of agriculture and to allow repair and restoration of this area of the stream. Long-time residents recall that the stream supported annual runs of steelhead trout until the early 1940's. The failure of the steelhead runs may have been caused by several successive years of below average rainfall, but no doubt siltation and removal of water from the stream also contributed to an unfavorable situation for steelhead migration. The lower portion of the stream has been channelized. The original streambed remains between Kellogg and Fairview Avenues, south of Hollister Avenue. This tree-lined area should be retained as a scenic backdrop and greenbelt for Goleta.

Dos Pueblos Creek originates in Los Padres National Forest and flows to the ocean through a ranch which has long maintained natural vegetation along its borders. It is widely regarded as one of the local streams which has suffered the least human impact. Tajiguas and Arroyo Hondo Creeks lie in situations very much like that of Dos Pueblos, and for portions of their lengths also remain in a fairly natural state. At least the latter, perhaps both, still contain trout.

Refugio Creek lies in a situation which, with respect to slope, soil conditions, and vegetation, is much like that of San Jose Creek. Several sorts of development have occurred along Refugio Creek, but for much of its length riparian areas retain the cover of natural vegetation. The stream has a rich invertebrate fauna and populations of small fish (Cyprinidae). The lower reaches have suffered some damage from agriculture, since orchards extend to the stream banks. As in San Jose Creek, water is piped out by canyon residents. Nevertheless, the creek remains one of the richest of the readily accessible streams in the area. It has served as a study area for several scientific investigations. With relatively minor efforts to mitigate existing adverse impacts, and with continued protection, Refugio Creek would have inestimable aesthetic and scientific value. A small area near the mouth of the stream is at present under public control, in Refugio Beach State Park.

These creeks represent transects of the entire height of the Santa Ynez Range. As the water flows to the sea, it passes through plant communities which vary in species composition. Plants or animals either in or near the water at the ridge sometimes are not present at lower elevations.

Jalama Creek provides a cool, moist habitat most of the year for many water-loving plants and animals (e.g. Maidenhair Fern (Adiantum) and Monterey Salamander (Ensatina). Also growing near the stream course is a small stand of California Walnut (Juglans californica), one of five in the County. Several plant communities abut this riparian habitat of the creek, including Coastal Sage, several types of chaparral, and the giant Coreopsis (Coreopsis gigantea).

Little is known about the many other intermittent streams in the County. San Antonio Creek on Vandenberg Air Force Base has marshes along it that should be protected. Some of the many back-country streams in the northeastern half of the County may have been affected by grazing and recreational use. However, much of this region remains close to its natural state and should be kept that way.

92. Permanent Streams: the Santa Ynez River (6-2-3, 5-2-2)

Location: A major river flowing east to west through the entire central portion of Santa Barbara County.

Biological comments: The Santa Ynez River, by virtue of its length, passes through a variety of plant communities and geologic formations. Because of differing topographic features and soil characteristics, it also supports several different ecological communities along its course, such as freshwater marshes, large reservoirs, and riparian communities. Numerous of the County's plants and animals are most abundant in, or are almost limited to, the Santa Ynez River area. Two of the five groups of California Walnut (*Juglans californica*) grow near the edge of the river. Cottonwood (*Populus trichocarpa*) in the County is largely restricted to the banks of the western half of this river. Box Elder (*Acer negundo*) similarly is most abundant along the Santa Ynez River. The physical and biological makeup of the river changes dramatically from east to west. The Pacific Pond Turtle (*Clemmys marmorata*) is most abundant in the eastern third of the river. The mouth of the river, on the other hand, supports the only recent nesting colony of the endangered California Least Tern in the County. (Metcalf, 1972).

Recommendations: The completion of the Cachuma Dam in 1952 illustrated the delicate nature of the Santa Ynez River. At the same time that the dam created a lake habitat, it eliminated a large Steelhead run. To preclude further environmental problems, future development of the Santa Ynez River should be halted, and further depletion of river water should not be tolerated. Far too many ecological communities would suffer with any further diminution in the flow of the river. For similar reasons, no noxious or polluting materials should be permitted to be added to the drainage where the river flows through urban areas.

95. Lake Los Carneros (5-2-2)

Location: Two small bodies of fresh water located on the grounds of the Stow House, Goleta.

Biological comments: Although Lake Los Carneros is not a natural body of water, it has become established in the biological sense, and at present supports a rather large and stable ecological community.

The plankton community, at least in the smaller lake, is as diverse and large as in any fresh water resource in the County. Both lakes are surrounded by typical aquatic vegetation (*Typha*, *Scirpus*, etc.), and portions of the surrounding land are wooded. At certain times of

the year, Lake Los Carneros quite possibly may support the largest diversity of birds of any area of similar size in the County. In ten years, 224 species have been recorded either on the lake or in the immediate vicinity. Sixty-four species are known to nest in the area, and approximately 200 species may be seen during any given year.

Recommendations: Lake Los Carneros is a marvelous scientific, educational, and recreational resource. It is believed that the ecological balance of the lakes can be maintained in the face of moderate recreational use. Regulated line fishing is indicated, and informal gatherings and walks seem to be tolerated by the biota. However, because of the severe erosion and the excessive noise they create, motorcycles should be strictly excluded.

95. Zaca Lake (5-2-3)

Location: A small natural lake, approximately four miles northwest of Figueroa Mountain and ten miles north of the town of Santa Ynez.

Biological comments: Zaca Lake is the only natural lake in Santa Barbara County. Because of its seasonal tendency to become anaerobic, the waters of the lake (over 40 feet deep) do not support a large or diversified biota. However, the area immediately around the lake is of extreme biological interest. Coulter Pines grow on the east shore. Several thousand feet to the northeast of the lake grows a stand of *Cupressus sargentii*. These cypresses are extremely spotty in their distribution and generally are found growing on extremely poor soil. Their present distribution is a result of their inability to compete with the more successful conifers. The Sargent Cypress group at Zaca Lake is the only Cypress growing wild in Santa Barbara County.

Natural lakes have one characteristic that makes them of unique importance. They serve as "ecological libraries", storing information about past biological communities in their vicinity. They serve this function because certain sorts of biological structures, such as pollen grains or the skeletons of tiny aquatic plants and animals, that fall to the bottom are preserved there. The successive layers of these fossilized remains can be dated, and so the past history of the organisms in the lake and the vegetation around it can be reconstructed very accurately. Because Zaca Lake is the only such "ecological library" in the County, it serves a unique function here.

Recommendations: Careful planning should be directed toward the future of Zaca Lake. The area could tolerate light recreation, but high intensity camping or other heavy recreational use would detract from the beauty and environmental health of the lake. Wales et al (1972) have suggested that the lake and its surroundings be considered as one of nine natural landmarks in Santa Barbara and Ventura Counties. In 1895 the Santa Maria Times editorialized that the scenery of Zaca Lake "reminds one of the Rockies or Sierras." Let us hope that the same will be said a century later.

96. Lake Cachuma (1-2-3, 1-1-1)

Location: In the eastern end of the Santa Ynez Valley, approximately 15 miles northwest of Santa Barbara.

Biological comments: Cachuma Lake, the largest inland body of water in the County, attracts numerous migratory birds and acts as home for a wide variety of plants and animals. A rookery of Great Blue Herons can be found in the dead Valley Oak (*Quercus lobata*) at the eastern end of the lake. It also is possible to observe such uncommon predatory birds as Sharp-shinned Hawks, Cooper's Hawks, Red-shouldered Hawks, Ospreys, and the endangered Southern Bald Eagle at this same section of the lake.

Recommendations: The eastern end of the lake, at present undisturbed, should continue to receive total protection. Traffic into this portion of the lake would reduce the attractiveness of this habitat to the large birds of prey which now frequent the area. It also would be desirable to maintain the Park Department's present policy of preventing use of the northern shore.

97. Coastal Vernal Pools (5-2-2)

Locations:-

- Two pools near Mescalitin Island, adjacent to the Santa Barbara Airport
- One pool at the western edge of Isla Vista
- One pool northwest of the Devereux Slough

Biological comments: Vernal pools, the results of rain or runoff which collects in areas of poor drainage, support highly interesting

ecological communities during late winter and early spring. Vernal pools commonly have a characteristic and unique biota. Indicator plants include Downingia spp., Lepidum spp., Limnanthes douglasii, and Lythrum hyssopifolia. Most of the animals present in these transitory bodies of water have drought-resistant stages and thus are able to persist year after year. Reproductively specialized crustaceans are commonly found in vernal pools.

Recommendations: Vernal pools' brief seasonal existence represents a marvelous opportunity for the biologist to examine the dynamics of opportunistic species. The pools' extreme susceptibility to disturbance justifies classifying them as unusual and delicate habitats. The comments we made about mosquito abatement in sloughs apply also to vernal pools, but the solution is somewhat easier here since we can select a few pools for special treatment. We recommend that whenever possible no control activities be carried out in these four pools, that otherwise only the minimum required to avoid severe nuisance be carried out, and that studies be done to help achieve this goal.

TWO GEOGRAPHIC AREAS OF PARTICULAR ECOLOGICAL INTEREST

Channel Islands

It is a common practice to divide the Southern California islands into the Northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz and Anacapa), and the Southern Channel Islands (Santa Catalina, San Clemente, Santa Barbara, and San Nicolas). Three of the islands. Santa Cruz, Santa Rosa and San Miguel, which together with Santa Barbara Island are within the County, lie on an east-west axis 19 to 27 miles from the mainland. Geologically, the three Northern Channel Islands in Santa Barbara County are a westward extension of the Santa Monica Mountains and have been separated from the mainland for at least 100,000 years, or perhaps several times as long. During this period the northern islands probably were interconnected, and did not separate finally until the most recent interglacial period, about 18,000 years ago.

The histories of the Channel Islands are quite similar. They were inhabited by Indians at differing population densities. A radiocarbon date of about 30,000 years B.P. (before the present) is available from a burned and disfigured dwarf mammoth found in an alluvial fan on

Santa Rosa Island. Early Spanish explorers probably made contact with the islands as early as the mid-sixteenth century. By the mid-nineteenth century white settlers arrived and introduced grazing animals. Grazing persists to the present. Santa Barbara, Santa Cruz and Santa Rosa Islands now are privately owned, while San Miguel is federally owned. Unlike the earlier inhabitants, the present landowners have shown a tendency to avoid overgrazing and have attempted to control and to limit the importation of "non-native" organisms.

The Channel Islands are extremely interesting to the biologist because they are a showcase for the way in which fundamental biological processes proceed. The workings of evolution and Mendelian genetics, both cornerstones to the science of biology, can be observed on these islands. For example, the relatively well-known geochronologies of the islands can shed light on the question of rates of evolution. The ecological phenomena of diversity and abundance also are more easily studied on islands because the relatively small size of most islands imposes more immediately binding constraints on the communities they support. Further, island peculiarities such as high rates of endemism, gigantism, and dwarfism are illustrated by organisms living on the Channel Islands.

San Miguel Island — Because of its small size (14 square miles) and rather limited topographic diversity, San Miguel Island supports fewer plant communities than do the other two, and has no trees. San Miguel also nicely illustrates the theory proposed by island ecologists that for islands at the same distance from the mainland, the smaller the island, the fewer species it supports. (See Table 2.) Perhaps the outstanding biological feature of San Miguel Island is the sea lion rookeries located on the extreme western end. These rookeries are the southernmost breeding localities for the Steller Sea Lion (*Eumetopias jubata*) (Bartholomew, 1967). The breeding population, now slightly more than 100 animals, has been reduced greatly from 2,000 in the late 1930's. It is believed that this reduction may be related to a gradual increase in the ocean temperature around the Channel Islands. In addition to the Steller Sea Lion, the California Sea Lion (*Zalophus californianus*) breeds on the western tip of San Miguel. Little or no breeding occurs on either Santa Cruz or Santa Rosa Island. San Miguel also is the only Santa Barbara County island to support a breeding population of the Northern Elephant Seal (*Mirounga angustirostris*). Finally, there have been occasional re-

TABLE 2. NUMBERS OF SPECIES OF PLANTS AND VERTEBRATES ON CHANNEL ISLANDS AND IN SANTA MONICA MOUNTAINS

Island	Area in Square Miles	No. of Species and Sub-species, Native Plants	No. of Species of Terrestrial Mammals	No. of Species of Amphibians & Reptiles	No. of Species of Resident Land Birds
Santa Cruz	96	420	10	9	37
Santa Rosa	84	340	4	4	25
San Miguel	14	190	2	3	15
Santa Monica Mountains (on the mainland)	320	640			

Source: Raven (1967), Savage (1967), von Bloeker (1967) and Diamond (1969).

TABLE 3. RARE AND ENDANGERED SPECIES ON THE CHANNEL ISLANDS OF SANTA BARBARA COUNTY

San Miguel Island

Plants

Helianthemum greenei Rob
Malacothrix indecora Green
Erysimum insulare Green
Phacelia divaricata insularis Munz
Eriogonum grande Greene
Galium californicum miguelense Jeps
Galium catalinense buxifolium Dempster

Animals

Urocyon littoralis (Island Fox)
Brown Pelican

Santa Rosa Island

Plants

Dudleya blochmanae insularis Moran
Dudleya candelabrum Rose
Erysimum insulare Greene
Arctostaphylos subcordata Eastw.
Phacelia divaricata insularis Munz
Salvia brandegei Munz
Lotus argophyllus adsurgens Raven
Pinus torreyana Parry
Gilia tenuiflora hoffmannii Grant
Eriogonum grande Greene
Galium californicum miguelense Jeps.
Castilleja mollis Penn.
Berberis pinnata insularis Munz
Eriophyllum nevinii Gray
Castilleja latifolia H & A

Animals

Urocyon littoralis (Island Fox)
Brown Pelican

Santa Cruz Island

Plants

Helianthemum greenei Rob
Haplopappus canus Blake
Malocothrix indecora Greene
Dudleya candelabrum Rose
Dudleya nesiotica Moran
Arabis hoffmanii Roll.
Thysanocarpus conchuliferus Greene
Arctostaphylos subcordata Eastw.
Lotus argophyllus adsurgens Raven
Lotus scoparius traskiae Raven
Malacothamnus fasciculatus nesioticus Kearn.
Eriogonum grande Greene
Galium catalinense buxifolium Dempster
Ribes thacherianum Munz
Mimulus brandegei Penn.
Berberis pinnata insularis Munz
Eriophyllum nevinii Gray
Sibara filifolia Greene

Animals

Urocyon littoralis (Island Fox)
Brown Pelican
Southern Bald Eagle
Peregrine Falcon

ports of Sea Otter (Enhydra lutris) (Allanson, 1955), but it is doubtful that this animal now breeds in the area. However, the type specimen for the southern race of the Sea Otter was taken from San Miguel in 1905, and it is reasonable to believe that the otter eventually could recolonize the area if the island is left undisturbed. Malva Rosa (Lavatera assurgentiflora), reported by Munz to occur on the Santa Barbara islands, actually may occur only near the elephant seal rookery on San Miguel Island. This plant should be included on the California Native Plant Society "Rare and Endangered Species" list.

Santa Rosa Island — The next largest (84 square miles) and the most seaward of the three islands, Santa Rosa supports a number of plant communities. Eight kinds of trees occur on the island including three oaks, two pines, a cottonwood, a cherry, and an ironwood. Of these trees, the ironwood (Lyonothamnus floribundus subspp. asplenifolius), oak (Quercus tomentella), and cherry (Prunus lyonii) are found elsewhere only on the Southern California islands (i.e. they are endemic). One of the pines, Pinus torreyana, is found only on Santa Rosa Island, and at an area north of San Diego. The island grove is about a half mile long, and occurs on a ridge. Most of the trees are wind-pruned, and none is more than 35 feet tall (Haller, 1967). Haller notes, however, that the trees appear healthy and that numerous young trees are growing on the slopes. In addition, Santa Rosa Island has three endemic plant taxa: Dudleya blochmaniae subspp. insularis (Live Forever), Arctostaphylos subcordata var. confertiflora (Manzanita), and Gilia tenuiflora subspp. Hoffmannii (Gilia) (Raven, 1967)

Island Fox (Urocyon littoralis), an example of island dwarfism (it is the size of a small housecat) and a rare carnivore (California Fish and Game, 1974), is found on Santa Rosa Island. As is the case with the foxes on the six larger islands, the Santa Rosa Island Fox is considered to be a distinct subspecies, Urocyon littoralis santarosae (von Bloeker, 1967). A list of rare and endangered species on the island is given in Table 3.

Santa Cruz Island — Santa Cruz is the largest of the four Santa Barbara County islands (96 square miles), and also is closest to the mainland. According to the theory of island ecology, Santa Cruz Island should support more species of organisms.

The data in Table 2 bear out the theory. Bishop Pine forests (Pinus muricata), recognizably different from mainland stands, can be found in several areas. Some elements (Acer macrophylum,

Arbutus menziesii, etc.) of the Mixed Evergreen Woodland community are found on one or two cool north-facing slopes. A unique type of woodland, the Channel Island Woodlands, is well represented on Santa Cruz Island by Cercocarpus betuloides var. blancheae, Heteromeles arbutifolia var. macrocarpa, Lyonothamnus floribundus, Prunus lyonii, Quercus agrifolia, Quercus macdonaldii, and Quercus tomentella. Various types of chaparrel can also be found on the Island: Chamise Chaparral (43), Mixed Chaparral (44), Coastal Sage (40), and Channel Islands Chaparral (49). The Channel Islands Chaparral is unique to most of these islands because it contains endemics from each. Also, in spite of heavy grazing, patches of native grasses (50) still persist on portions of Santa Cruz Island. The Island also supports a large population of Santa Cruz Island Fox (Urocyon littoralis santacruzae). The Island Scrub Jay documents the phenomenon of gigantism, for it is about 30 percent larger than the mainland form.

Besides having more plant communities and more species of plants, Santa Cruz Island also supports more species of birds, mammals, reptiles and amphibians than does either San Miguel or Santa Rosa (Table 2). Thus, such common mainland forms as Gopher Snake (Pituophis melanoleucus), Side-blotched Lizard (Uta stansburiana), and Big-eared Harvest Mouse (Reithrodontomys megalotis) are found on Santa Cruz Island, but not on either San Miguel Island or Santa Rosa Island. The rare and endangered species are summarized in Table 3.

Santa Barbara Island — This island, consisting of only one square mile of land, is 34 miles from the mainland. Although very tiny, and in spite of its relatively small biota, Santa Barbara Island is very interesting to the biologist. The Island Night Lizard, (Klauberina riversiana), persists only on Santa Barbara, San Nicolas, and San Clemente Islands. This animal is regarded as a primitive lizard which survives only because there is no predation by snakes or severe competition from other lizards on these isolated islands. The flora of Santa Barbara Island is interesting because of its relatively high degree of endemism; six of the 40 species are shared with several other islands. Further, until it was driven to extinction by feral rabbits, Dudleya traskiae was found only on Santa Barbara Island. The California Sea Lion (Zalophus californianus) is known to breed on the Island, and Northern Elephant Seal (Mirounga angustirostris) regularly sun themselves on the rocks there.

Analysis and Recommendations — The owners of Santa Cruz Island

and the owners of Santa Rosa Island are managing their ranching in ways which tend to preserve those natural ecosystems that remain on the islands. On both islands, building construction has been kept to a minimum and roads are not paved. The owners have been extremely cooperative in encouraging scientific research and study by University classes on Santa Cruz Island. Many scientific publications have resulted from this activity.

We believe that the grazing by introduced mammals on all these islands has been destructive to the natural ecosystems there. However, sheep have been removed from Santa Rosa and the number reduced on Santa Cruz Island; we believe that this reduction has been beneficial and should be continued. We recommend that the introduced feral mammal grazers be reduced drastically on the other islands.

As long as the owners continue their enlightened policies of land use and permit scientific research, the natural ecosystems are protected and the islands serve as excellent research sites. Because we know so little about how ecosystems function, it is essential to protect places such as this from further human use. Because these are islands, they would be doubly attractive to visitors. Any change in island status that would promote heavy traffic would result in the trampling of some of the more delicate plant communities, frightening of the sea lions, and collection of the intertidal abalones. Because species have smaller populations on islands, they are more vulnerable to local extinction, and because recolonization from the mainland or other islands also is less likely, we believe that the numbers of species would decline drastically if human traffic increased from the present low level. For all these reasons we recommend that entry to the Islands continue to be regulated; our code designation therefore would be 1-1-1.

<u>Vandenberg Air Force Base</u> (3-2-2, 7-2-2, 5-2-2, 1-1-1, 1-2-2, 5-1-1)

<u>Location</u>: Approximately 160 square miles of coastal land between Point Sal and Point Arguello.

<u>Biological comments</u>: Because of the specialized interests of the military, the vast majority of the Base land is undisturbed. Wales, Matlovsky, and Bennett (1972) in their <u>Inventory of Potential Natural Landmarks of Santa Barbara and Ventura Counties</u>, submitted to the Institute of Ecology of the University of California, Davis, singled out the Vandenberg area for special consideration. Twelve plant communities lie within the confines of the Base, including Coastal

Dunes, Coastal Salt Marsh, Coastal Sage, Chamise Chaparral, Mixed Chaparral, Introduced Grasses, Southern Oak Woodland, Coast Live Oak Forests, Mixed Evergreen Forests, Coastal Pine Forests, Lowland Riparian Woodland, and Freshwater Marsh. Clearly, a like diversity of animals can be expected to be associated with this array of plant communities.

Because of its geographic location, Vandenberg experiences two different climatological regions. The vegetative composition to some degree reflects these meteorological parameters, and botanists regard the area as in many respects representing a boundary between northern and southern California plant types. Coincidentally, largely because of the flow of the California Current, which swings seaward south of Points Arguello and Conception, drastic differences in the makeup of marine communities can be observed on either side of these points. Fish and other marine organisms are equally affected by these changes in temperature. Such common marine invertebrates as the Spiny Lobster and the Sea Pansy are not found north of Vandenberg. Conversely, numerous organisms (e.g. the crab *Cryptolithoides*, certain hydrozoans, etc.) with a more northerly range are not found south of Vandenberg except on those Channel Islands bathed by the California Current.

The coastal dunes between Point Sal and Purisima Point and those immediately south of Purisima Point are in an excellent state of preservation. Vehicular traffic largely has been excluded, thus leaving the extremely delicate dune plant community in good biological health. Mount Tranquillon is a striking beacon on the southern portion of the base. A healthy example of the mixed evergreen plant community, discussed earlier, lies on the north-facing slopes of the Tranquillon Ridge. The area also is dotted with patches of Bishop Pine (*Pinus muricata*), and in at least one location, Pine Canyon, the Closed Cone Pine associate *Eriodictyon capitatum* also is known to occur. Finally, portions of Vandenberg are known to contain deposits of diatomaceous earth from which some very striking vertebrate fossils have been collected.

Recognized rare and endangered species that are present include the following.

Agrostis hooveri (locally distributed)
Ceanothus impressus (Burton Mesa, Titan Gate, etc.)

Cirsium rhothophilum (Coastal Strand and Dune)
Senecio blochmanae (Coastal Strand and Dune)
Corethrogyne leucophylla (Coastal Strand and Dune)
California Least Tern (summer visitor)
Southern Bald Eagle (migrant)
Peregrine Falcon (migrant)

Other uncommon organisms are Pinus muricata, Ceanothus ramulosus var. fascicularis, and Arcostaphylos pechoensis var. viridissima.

Analysis and Recommendations — Because of its undisturbed nature, present restricted use, and unique biological characteristics, Vandenberg Air Force Base ideally is suited for preservation as a scientific research area. The often quoted comments of Remington (1971), while discussing the future status of the Channel Islands, may be equally applicable to the Vandenberg.

> "... even relatively little park-style recreational development and occupancy will surely be disastrous ... In contrast to their modest rank as tourist wonders these lands are a scientific resource, far superior in biological and archaeological research value to most national parks and monuments ... as an environmental complex for ecological and evolutionary education at the university and high school level, superb use could be made ... I would propose a new concept that might be known by some such name as National Scientific and Educational Preserve ... The focus would be on protecting wild areas as scientific sites rather than providing for the large number of tourists for whose needs the National Park Service functions."

CONCLUSIONS AND RECOMMENDATIONS

In making the following recommendations, we have been guided by the conviction that it is imperative to preserve for the future as much biological diversity, that is, as many different species and communities, as possible. In particular, our goal has been to try to ensure that Santa Barbara County's ecosystems will remain in 50 or 100 years pretty much as they are today. The County is well endowed with biological diversity, containing examples of half of the plant communities found in California. In the rapidly urbanizing coastal area of Southern California, Santa Barbara County is an ecological island in a spreading sea of megalopolis, in part because it has been blessed with environmentally conscious citizens.

This is a time of accelerating loss of species, and each species that becomes extinct represents an option foreclosed; the genetic material, once lost, can never be reconstituted. If we were to do nothing to preserve the diversity of species, we would be condoning the loss of an estimated 100 species per year. While it is true that we can survive without many species that now exist, the problem is that we do not know how many we need to survive, and more important, which species we need now or will need in the future.

It is important to realize that, in order to preserve species, we must preserve whole ecosystems. Since such preserved areas are essentially islands, there will be a continual process of local extinctions of species and simplification of the community, such as occurs on oceanic islands. To minimize this problem, preserved areas should be as large and numerous as possible, they should be as round in shape and clustered as possible, and they should be surrounded by buffer zones.

Having identified the areas of special biological interest, two other classes of areas remain in the County. First are the existing urban and agricultural lands which generally are of little interest to the biologist, with rare exceptions. However, intensive urban and agricultural uses can affect ecological communities through air pollution, use of pesticides, or feedlot runoff; and such impacts should be considered when preparing land use plans. Second are the ecosystems in the remainder of the County which, while they may not be rare or endangered, will nonetheless disappear if the areas are transformed to urban or agricultural use. By and large, these areas lie in hilly or mountainous country and are unlikely to come under pressure for change of use. The major exception, in which our recommendation conflicts with current use, is the rolling grazing lands of the Santa Ynez Valley. These areas, famous for their beautiful "parkland" landscape of oak trees and open fields, will not survive in their present state because grazing prevents the oaks from regenerating. Some change in use will be necessary if we are to maintain these ecosystems.

To preserve the ecosystems of biological interest, the County and the cities should adopt the following policies.

Coastal Strand and Marine Habitats

— Collecting at Carpinteria and adjacent coastal bluffs should be strictly prohibited.

- At North and South Coast rocky points, recreational use should be limited, and all but restricted scientific collecting should be prohibited.

- Portions of the South Coast intertidal preserve should be made available for light recreation use, while certain key areas should be closed to the public and limited to scientific investigations. Fishing should be prohibited in the entire area.

- Point Sal should be classified as a natural area with access permitted, but the present amount of human activity should not be markedly increased.

- Naples Reef and inshore area should be maintained primarily as a scientific research and educational area. The Local Coastal Program, in consultation with the state Department of Fish and Game, recommends that continued recreational use of this area be permitted and monitored to prevent depletion of marine resources.

- Coastal dunes should be protected from all but scientific and educational uses, except portions of the Guadalupe Dunes already scarred by ORV's. Wherever possible, dune areas should be placed in a "preserve" status. Ocean Beach County Park should not be expanded.

- In Goleta, Devereux, and Carpinteria sloughs, scientific and educational research and recreational activities should be limited, traffic should be minimized, and the present size of the sloughs should be maintained. The Mosquito Abatement District should be encouraged to reduce control activities to the minimum level needed to avoid severe nuisance problems and to carry out studies to achieve this goal.

- The County Park in the Surf Area should not be expanded, ORV's should not be allowed on the dunes, and traffic should not be permitted in the marshes.

Chaparral and Scrub Habitats

- In six selected low use chaparral preserves, only educational and research programs should be conducted.

- In the Chaparral and Coastal Pine Habitat in the western Santa Ynez Mountains, recreational use should be limited. Grazing cattle should not be permitted in the Pine-Yerba Santa Community.

The area to be considered is a relatively narrow band of Bishop Pine and Yerba Santa bordered on the west by Damsite Canyon and on the east by Canada de Alegria.

Grassland

— Native grasslands should be subjected only to regulated scientific study wherever they occur.

— On the More Mesa grasslands, only very light recreation restricted to trails should be permitted, in order to protect the White-tailed Kite.

— In the Santa Maria Grassland where the Spadefoot Toad lives, moderate intensity recreation can be tolerated as long as soil disturbance is minimized.

Woodland and Savanna

— To support the Central Oak Savanna and protect the White-tailed Kite, a program of seedling protection should be instituted in the Santa Ynez Valley and grazing restricted to appropriate areas.

— In the Santa Ynez Valley canyon communities, unregulated and haphazard development should be prohibited, roads should be kept narrow, and cattle grazing closely controlled.

— In the Southern Oak Woodland along Rincon Creek, urban development and all but very light recreation should not be allowed.

— In the Foothill Woodland between Santa Cruz Guard Station and Wheat Peak, development should be stopped, and further road construction should be prevented. Moderate recreational use would be acceptable.

Forest Habitats

— The Canyon Oak-Bigcone Spruce Forest Habitat is a relatively rare plant community that should be protected from development and heavy recreational use.

— In Coast Live Oak Forests, urbanization, expansion of agriculture, and moderate or heavy recreational use should not be allowed. A natural park would be desirable.

- In the Mixed Evergreen Forest Habitat, disturbance should be minimized by keeping roads as they are and curtailing development.

- In the Jualachichi Summit area, Jalama Road should not be widened, and cattle grazing should not be permitted near the summit.

- The Purisima Hills should be preserved by limiting road widening and restricting the number of trails.

- In the Coulter Pine Forest on the ridge of the Santa Ynez Mountains, the practice of spraying herbicide should be curtailed. The U.S. Forest Service has banned ORV's in order to minimize disturbance of the habitat.

- In the Miranda Pine Mountain and associated upland area, light recreation activities could be allowed, but road building and development should be stopped.

Riparian Forests and Woodlands

- Nojoqui Falls Park should not be expanded in the direction of the falls, and recreational use should be limited to the trail.

Introduced Trees and Scrubs

- Around trees serving as traditional roosting sites for butterflies and Turkey Vultures, a 100 foot wide buffer zone should be established for protection of these species.

Swampy Habitats

- Fresh water marshes are suitable for light recreation, but should be protected from other uses.

Aquatic Habitats

- The nine streams in the County deserving special protection are Rattlesnake, Mission, San Roque, San Jose, Dos Pueblos, Tajiguas, Arroyo Hondo, Refugio, and Jalama Creeks. Only scientific study and light recreation activities should be permitted in or near these

streams, and buffer strips at least 100 feet wide should be established. Pesticides should not be used in these buffer zones.

- Development of the Santa Ynez River should be halted, the river water should not be depleted further, and no pollutants should be discharged into the river.

- At Lake Los Carneros, moderate recreational use could be tolerated, but motorcycles should be strictly excluded.

- Zaca Lake can tolerate limited recreation activities. However, high intensity camping or other heavy recreational use would detract from the beauty and environmental health of the lake, which has been suggested for classification as one of the nine natural landmarks of Santa Barbara and Ventura Counties.

- The eastern end of Lake Cachuma should remain undisturbed to protect the bird habitat, and the lake's north shore also should remain closed to the public.

- With the agreement of the Mosquito Abatement District four specially selected vernal pools should receive the absolute minimum amount of treatment needed to avoid severe nuisance problems.

Two Geographic Areas of Particular Ecological Interest

- On the Channel Islands, human entry should continue to be limited in order to protect the natural ecosystems. Grazing should be closely regulated to prevent destruction of plant communities.

- Vandenberg Air Force Base should be preserved as a scientific research area and classified as a National Scientific and Educational Preserve.

An Interim Implementation Policy

- The County should evaluate each of these recommendations in preparing environmental impact reports, in order to ensure that adequate consideration is given to preserving ecological communities.

Mineral Resources

INTRODUCTION

Three major classes of mineral resources have been found in Santa Barbara County. Petroleum and natural gas in onshore and offshore fields are the principal mineral fuels, accounting for approximately half of the total value of mineral production in the County. Mercury, the only metallic resource, has not been produced commercially in recent years. The non-metallic mineral resources include diatomite, limestone, phosphate, rock, sand, and gravel. While additional exploration may uncover new resources sites, it is unlikely that any major new commercial grade deposits of mineral resources will be discovered in the near future. However, over the long term, increasing demand for scarce mineral sources may lead to renewed exploration and extraction.

The study of mineral resources for the Conservation Element focused primarily on the County's known resources. Analysis of offshore oil drilling was not included in this study because the County and the cities lack jurisdiction over this activity, and because responsible State and federal agencies currently are studying the subject. Once these studies are complete, the County should evaluate the findings and review State and federal policies on offshore oil drilling in the Santa Barbara Channel as a basis for making any recommendations that are necessary to bring these policies into conformity with the Comprehensive Plan.

LOCATIONS OF KNOWN RESOURCES

On the County-wide Mineral Resources map, all known resource sites are indicated. Only the names of the oil and gas fields are shown. Production statistics for each of these sites are available. For obvious reasons, abandoned oil and gas fields are not shown. Information on these resource sites was compiled from maps and publications of the California Division of Oil and Gas, the County Assessor's Office (Mineral Appraiser), the California Division of Mines and Geology (Bulletin 180-C), the U.S. Soil Conservation Service, the County Department of Public Works, and the County Petroleum Administrator.

Oil and Gas Fields — Twenty-six oil and gas fields are located in the County. However, only 18 fields yielded oil and 13 fields produced gas in 1973. In addition, five fields have dry gas reserves, but only three are productive: Caliente Offshore, Gaviota Offshore,

Santa Barbara County Mineral Resources

- Oil, Dry Gas Field (Name)
- Diatomite
- Rock, Sand, or Gravel
- Other Rock, Sand, or Gravel Source
- Phosphate
- Quicksilver Mines

GUADALUPE
SANTA MARIA
SANTA MARIA RIVER
State Route 166
BETTERAVIA
SANTA MARIA VALLEY
CASMALIA
ORCUTT
CAT CANYON
JESUS MARIA
HARRISTON
LOS ALAMOS
ZACA
Zaca Lake
BARHAM RANCH
PURISIMA POINT
VANDENBERG AIR FORCE BASE
LOMPOC
SURF
SANTA RITA
LOS OLIVOS
BALLARD
BUELLTON
SOLVANG
SANTA YNEZ
SISQUOC RIVER
LOS PADRES NATIONAL FOREST
RUSSELL RANCH
CUYAMA RIVER
NEW CUYAMA
CUYAMA
CUYAMA SOUTH
VENTUCOPA
SAN LUIS OBISPO COUNTY
POINT ARGUELLO
LAS CRUCES
GAVIOTA
CAPITAN
POINT CONCEPTION
CONCEPTION OFFSHORE
CUARTA OFFSHORE
ALEGRIA OFFSHORE
CALIENTE
HONDO
ELLWOOD
GOLETA
LA GOLETA
SOUTH ELLWOOD OFFSHORE
COAL OIL POINT OFFSHORE
MONTECITO
SANTA BARBARA
MESA
SUMMERLAND
SUMMERLAND OFFSHORE
CARPINTERIA
N
MINERAL RESOURCES

available for analysis, the most noteworthy example being Evans' study of sand and gravel in Orange County (Evans, 1973). This type of analysis, however, was outside the scope of study prescribed for the Conservation Element.

Oil and Gas Production — Over 1,800 wells in the County produced 16.7 million barrels of oil in 1976, down slightly from 1975 production, and continuing a downward trend in production levels. In 1965 for example, oil production was more than 26 million barrels. The decline in natural gas production has been even more marked, dropping from 81.7 billion cubic feet in 1965 to 18.5 billion cubic feet in 1976. The County's proved acreage for oil production at the end of 1976 was 28,345, down slightly from the 1975 level. In 1976 Santa Barbara's oil and gas production accounted for 5 per cent of the state's oil production and 6 per cent of the state's natural gas production.

Preliminary figures for 1977 indicate that onshore oil production increased slightly from 13.9 million barrels to 14.9 million. According to the state Division of Oil and Gas, this increase is largely due to secondary recovery efforts. Offshore production in state leases dropped from 3.4 to 3 million barrels, and production in federal leases was down 12.2 per cent to 12.2 million barrels. Total 1977 production from onshore County wells and all channel wells was 29.3 million barrels, down 6.26 per cent from 1976. Production statistics from 1969 through 1976 are presented in Table 1.

Mercury Production — At present, mercury is not being mined in the County. In fact, throughout the state mercury production in 1973 dropped 78 per cent from 1972 levels, and only three small mines were producing on an intermittent basis. Producers are holding back because of the low price of mercury caused by curtailed military usage following the end of the Vietnam War and by the federal Environmental Protection Agency's tight emissions controls (Davis, 1974). Geologists of the California Division of Mines and Geology have predicted that many of the mines not now in operation again will become active once the price per flask reaches $400 (Davis and Evans, 1973). The average price in 1973 was $288. Statistics on mercury reserves are not published.

Diatomite — Statistics on production and reserves of diatomite in the County are not published. However, previous studies have estimated that Santa Barbara County deposits have a useful life of 80 years (Mineral Appraiser, personal communication).

TABLE 1. OIL AND GAS PRODUCTION IN SANTA BARBARA COUNTY

	1969	1970	1971	1972	1973	1974	1975	1976
Average number of producing oil wells								
Actual	1,611	1,587	1,605	1,603	1,595	1,673	1,755	1,849
Actual and potential	2,645	2,694	2,814	2,834	2,873	2,773	2,814	2,889
Average number of producing gas wells								
Actual	16	15	13	26	26	23	8	8
Actual and potential	33	33	33	32	31	32	18	16
Oil production (millions barrels)[a]	21.7	20.2	19.0	18.2	19.1	18.5	17.1	16.7
Gas production (million cubic feet)	78,326	62,643	48,371	52,498	46,427	29,880	21,668	18,501
Proved acreage	32,965	28,265	28,880	28,085	28,045	27,925	27,865	28,345

Source: Annual Reports of the State Oil and Gas Supervisor, California Division of Oil and Gas.

a. Does not include federal offshore leases.

Limestone — Statistics on production and reserves of limestone in the County are not released. The deposits of high grade algal limestone in the Eocene Blanca Formation are known to be extensive; so it might be reasonable to expect these reserves to be adequate at least for near term needs (California Region Framework Study Committee, 1971).

Phosphate Production — In the 1960's phosphate was mined in the County in relatively small quantities, primarily to meet the needs of farmers in the San Joaquin Valley. Recently, there has been renewed interest in this deposit, and commercial production may resume. However, phosphate is not produced at the present time in the County.

Rock, Sand, and Gravel — The historical record of rock, sand, and gravel production, shown in Table 2, is not as complete as the record for oil and gas, mainly because of limitations on disclosure. Sand and gravel production declined from the 1968 high of 2,494,000 short tons to a low in 1971 of 1,190,000 short tons. However, in 1972 production once again increased to 1,536,000 short tons. Stone production in 1972 was 19,000 short tons.

TABLE 2. SAND AND GRAVEL PRODUCTION IN SANTA BARBARA COUNTY

Year	Production (Short Tons)
1967	1,593,000
1968	2,494,000
1969	1,262,000
1970	1,120,000
1971	1,190,000
1972	1,536,000

Source: California Division of Mines and Geology

Over the past several years, production of sand and gravel has ranged from 4.4 to 6 tons per capita, well below the California Division of Mines and Geology's estimate of 7.7 tons per capita needed in a growing area but above the minimum level of 4.4 tons per capita needed in a stable, built-out or slow growing area (Evans, 1973). Some sand and

gravel currently is imported from Ventura County and Orange County by Consolidated Rock Products Company

ENVIRONMENTAL IMPACTS

Generally, knowledge about potential adverse environmental impacts resulting from mineral resource extraction in the County is quite limited. Only a few activities have been studied in detail, and even for these the record still is spotty. As a result, it has not been possible to assess systematically the environmental impacts of each mineral extraction activity in the County. Before suggesting a procedure that might increase the flow of knowledge and improve the state of information on this subject, it may be helpful to review some of the problems that presently exist and to indicate some of the actions being taken to mitigate the adverse impacts.

The repercussions of an oil spill or blow-out at an onshore drilling site have been well documented in the popular press as well as in scientific journals. Under the direction of the California Oil and Gas Division, oil spill contingency plans for District 3, which includes Santa Barbara County, have been prepared. These plans are designed primarily to minimize adverse environmental impacts, particularly on natural drainage systems. State requirements also have been promulgated to curtail wastewater discharges into the ocean and to regulate Class I dump sites for disposal of oil field wastes. But the oil industry still needs to refine its fail-safe programs so that its imperfect record can be improved.

The major problems associated with mercury mining stems from the proximity of the Cachuma District Quicksilver Mines to Lake Cachuma. Because leaching from an open pit operation could reach the lake, the potential adverse impact on water quality must be scrutinized carefully. An environmental impact report being prepared in conjunction with a proposal to reopen these mines will examine the ability of the proposed new leaching method to meet federal standards and to safeguard water quality.

Mining diatomaceous earth presents similar problems that have not yet been fully resolved. Airblown particulate matter has a serious impact on air quality. In northern Santa Barbara County in 1970, over nine tons of particulate matter were emitted by mineral operations — a figure representing close to 70 per cent of the total

amount of particulate matter emitted daily in this area. County Air Pollution Control District regulations have been relatively effective in reducing these emissions. To further reduce the level of emissions, the federal Environmental Protection Agency recently ordered that additional dust collectors be installed at the Lompoc mines. Buffer zones surrounding the diatomite mines, as well as around other mineral extraction activities, may be the only viable way to reduce their impact on particularly sensitive members of the population, including people with respiratory problems, young children, and the elderly.

Adverse environmental impacts from rock, sand, and gravel operations are manyfold. For example, the activities can undermine adjacent development, reduce detrital material flowing to the ocean, thereby aggravating coastal erosion problems, and pollute groundwater basins if the pits are backfilled without proper precautions. According to one study, sand and gravel mining in the Santa Ynez River and the Santa Maria River during the period from 1945-55 removed one quarter to two-thirds, respectively, of these rivers' annual estimated sediment yield. Continued production at this rate could seriously impair beach formation along the northern section of the Santa Barbara Coast (Bowen and Inman, 1966, as cited in the South Central Coast Regional Commission's Report on Geology, 1974). The extent and severity of these potential problems in the County has not been studied in a systematic fashion, so it is not possible to determine what action might be necessary to correct potential adverse impacts.

In order for the County to be able to minimize adverse direct or indirect environmental impacts, it should have discretionary review authority over all mineral extraction activities on an annual basis, particularly over the expansion of present activities. This review should be conducted as prescribed under the California Environmental Quality Act. It may be that certain small operations do not have significant adverse environmental impacts, in which case they should be allowed to continue as at present or to expand if desired. However, in those instances in which the impacts of mining would pose a serious threat to the natural or human environment, the County should be able to curtail operations or to require that remedial action be taken in a timely fashion. In reviewing mineral resource activities' potential impacts, cumulative impacts on the environment must be considered, as well as the impacts of

individual operations. For example, all of the sand and gravel operations in a river basin have to be analyzed collectively as well as individually, and the cumulative impact on sediment yield for beach formation and replenishment assessed. Similarly, projected waste discharges into the air or water from a proposed activity must be considered in the light of background levels of pollutants already being emitted and projected to be emitted by existing activities (and other projected activities) before reaching a decision on the particular proposal.

FUTURE NEEDS AND POTENTIAL DEFICITS

In one sense, the question of future mineral resources needs and potential deficits in the County cannot be answered precisely until the population and economic studies that will be made for the Comprehensive Plan have been completed, and the Land Use and Circulation Elements have been revised. For example, the demand for aggregate material is dependent on the rate and location of urban development in the County and, in all likelihood, would differ under each possible growth and development alternative. Opportunities for the importation of aggregate materials from adjacent counties likewise will depend on their future local needs. However, some mineral resources, particularly oil, gas, mercury, and diatomite, will be mined primarily to meet regional, state, and national demands. Forecasting the future needs and potential deficits for exported resources is well beyond the scope of this study, especially in the light of changing international political factors, new mining, processing, and transportation technology, and expanding environmental protection controls.

Under the circumstances, the most useful next step for the County would be to undertake a study in cooperation with the California Division of Mines and Geology to determine future needs and potential deficits of rock, sand, and gravel and other mineral resources production, once the Comprehensive Plan has been completed. The Division of Mines and Geology already has conducted a detailed study of the sand and gravel industry in Orange County and has indicated its interest in pursuing similar studies in other counties, according to James R. Evans, Geologist and Mineral Resources Coordinator. The Los Angeles metropolitan region already suffers from a shortage of exploitable local sand and gravel deposits that will have an increasingly adverse economic impact.

Ventura County also is experiencing potential problems in the Santa Clara River deposits and has begun to import gravel from Los Angeles County (Evans, personal communication). The critical factor will be to determine how Santa Barbara County can protect its resources and exploit them to meet future needs without adverse environmental consequences.

Questions such a study should address include the following:

— What are the reserves of existing sand and gravel deposits and other mineral resources currently being mined?

— How much longer will these sites be commercially viable?

— How much rock, sand, and gravel is imported into the County, where is it coming from, and what are the prospects for continued reliance on out-of-County resources? (It also would be important to determine whether Santa Barbara County is exporting any rock, sand, and gravel.)

— Where are potential exploitable rock, sand, and gravel deposits located in the County, and what is the commercial grade at each location?

— What are the potential adverse environmental impacts at each site, and how could they be mitigated?

Once these questions have been answered, the County and the cities can formulate a comprehensive program for the protection and exploitation of their valuable mineral resources that responds to anticipated future needs. It also will be important to evaluate the answers to these questions in relation to the Open Space Element, the Recreation Element, and the Land Use Element of the Comprehensive Plan to determine what priorities might be assigned to resource sites for exploitation, and what sites should remain untouched because of potential adverse impacts that could not be mitigated.

A vital component of a program for the protection and exploitation of the County's mineral resources is the rehabilitation and ultimate use of depleted or abandoned mineral resource sites. In this context, operators should be required to provide plans for rehabilita-

tion of their sites, once all of the commercial grade deposits have been extracted, and to indicate the ultimate use of the sites. In many instances, opportunities for use during rehabilitation may exist. For example, a mineral resource site could be used for solid waste disposal if the bottom of the pit were above the groundwater table and no threat of contamination existed. When the site had been filled, it could be improved for park or recreation use. Such a program in Orange County resulted in a park and ballfield and a golf course.

Other uses of abandoned or depleted mineral resource sites that do not require filling include water-based recreation, and water percolation of groundwater recharge. In the Livermore-Amador Valley east of San Francisco, Kaiser Sand and Gravel Company donated one of its abandoned gravel pits, which had been filled with water, to the East Bay Regional Park District. Opportunities in Santa Barbara County also may exist for innovative rehabilitation and ultimate use plans.

Under current County regulations, an applicant for a conditional use permit for a mineral extraction activity is not required to submit a rehabilitation or ultimate use plan. Experience in other California communities has demonstrated that the benefits of this requirement can be significant and far-reaching. A case by case examination of the existing mineral resource activities in the County might reveal valuable opportunities to coordinate mineral resource extraction with public recreation, flood control, solid waste management, or groundwater recharge programs.

CONCLUSIONS AND RECOMMENDATIONS

Mineral resource extraction in the County makes a relatively important contribution to the local, state, and national economies, and, as such, should be encouraged. At the same time, every effort should be made to minimize direct and indirect adverse environmental impacts, and to achieve and maintain federal and State standards of emissions controls and environmental quality. Much already has been done by the County to achieve these goals, the oil drilling ordinances and the air and water pollution control regulations being prime examples. However, the County and the cities should continue to push for necessary environmental safeguards, as well as to encourage exploration for new resource

sites. To meet these general objectives, the County and the cities should adopt the following policies on mineral resource extraction:

- No mineral resource extraction should be permitted in the County if significant adverse impacts on the air, water, or land environment would result, if flooding and erosion problems would be increased, or if polluting emissions likely to be generated directly or indirectly by the activity in question would result in adopted federal or State environmental quality standards being exceeded.

- Under provisions of the Surface Mining and Reclamation Act of 1975, the County must adopt ordinances to establish procedures for the review of site reclamation plans and issuance of permits to conduct surface mining operations. Within one year after State geologists map areas of mineral deposits, the County must establish resource management policies for incorporation into the Comprehensive Plan. The Board of Supervisors on October 23, 1978, adopted Ordinance No. 3065 (Case No. 77-OA-33), amending Santa Barbara County Zoning Ordinance No. 661 relative to surface mining operations and reclamation plan requirements. The State has not yet mapped County mineral resources.

- The County, in cooperation with responsible federal and State agencies, should undertake a study to evaluate its mineral resources, particularly rock, sand, and gravel, to determine how to protect and exploit them to meet future needs without adverse environmental impacts. The Comprehensive Plan then should be examined in light of the new information gleaned from this analysis, and revisions of the plan made as necessary to achieve maximum compatability of mineral resource extraction programs with other planned land uses. The results of studies of offshore oil drilling also should be considered in this analysis.

Agricultural Resources

INTRODUCTION

Agriculture plays an important role not only in Santa Barbara's economy but also in the state and national economies. As a consequence, the agricultural resources of the County must be assessed carefully in order to prepare the best possible program for their conservation and to integrate that program into the Comprehensive Plan. Santa Barbara County can escape the fate of the once fruitful Santa Clara Valley through wise land use planning that recognizes the need to preserve valuable agricultural resources and balances that need against the demand for land for urban growth. Suitability of land for agriculture has been analyzed in relation to soils, water resources, and ecological systems. The natural resources required for agricultural production must be present in the right combination to create a productive environment. At the same time, potential adverse impacts of agricultural operations cannot be ignored. The effects of agricultural activities on air and water quality must be assessed, along with their impact on sensitive ecological communities and on residents of nearby urban development, when judging the suitability of an area for agriculture.

MAJOR CROPS AND HISTORICAL TRENDS

Each year the richness of Santa Barbara County's agricultural production is summarized in the Agricultural Commissioner's Annual Crop Report. In 1976, production in the County reached an all-time high with 30 crops grossing over a million dollars each. In Table 1 these agricultural products are ranked according to gross value. Table 2 illustrates the yearly increase in agricultural production values. County-wide, a total of fifteen vegetable crops, ten field crops, and six fruit and nut crops are produced along with nursery, flower, and seed crops and beef and dairy products. The climate, soils, and water resources provide unique opportunities for many specialty crops in the County, as this list and the summary analysis below clearly indicate.

Cattle and Calves

Beef cattle graze on an estimated 750,000 acres of grasslands in the County. Some ranchers raise both cows and calves, while others prefer to buy young livestock for weight gain. Two major feed lots are currently in operation, one in Betteravia and one in Santa Maria, with a combined total of approximately 12,000 head of cattle. Over the first eight years of the past decade, annual cattle and calf production averaged 101,000 head, while in 1972 production dropped to 79,600 head, to be followed in 1973 by a new low of 76,500 head. In 1976 cattle and calf production dropped to 62,823. Clearly, the increasing cost of grain caused by shortages and sales overseas was

TABLE 1

1976 MILLION DOLLAR PRODUCTS

1976 Ranking			1975 Ranking
1.	Cattle and Calves	$19,870,060	1
2.	Lettuce, Head	16,408,200	2
3.	Broccoli	12,321,552	3
4.	Strawberries	11,236,050	5
5.	Celery	8,461,800	10
6.	Alfalfa Hay	7,441,581	13
7.	Avocados	7,243,207	6
8.	Milk, Cow	7,014,330	7
9.	Dry Beans	6,776,008	12
10.	Indoor Decorative Potted Plants	6,277,590	11
11.	Lemons	5,856,650	4
12.	Cauliflower	5,623,680	9
13.	Flowerseed	4,315,600	14
14.	Chrysanthemums, Cut	3,873,367	16
15.	Eggs	3,872,700	19
16.	Pasture, Nonirrigated	3,066,279	18
17.	Orchids	2,792,754	20
18.	Grapes, Wine	2,644,814	22
19.	Bean Seed	2,583,124	8
20.	Ornamental Trees and Shrubs	2,046,581	25
21.	Potatoes	2,009,280	17
22.	Ground Cover, Bedding and Veg. Plants	1,945,750	27
23.	Tomatoes	1,734,104	15
24.	Lettuce, Leaf	1,545,620	30
25.	Cabbage	1,527,735	23
26.	Grain Hay	1,489,600	26
27.	Carrots	1,470,469	24
28.	Sugar Beets	1,323,348	21
29.	Gypsophila	1,142,747	29
30.	Greenhouse Grown Flowers and Foliage	1,109,620	28

Source: 1976 Agricultural Crop Report, Agricultural Commissioner

TABLE 2

COMPARATIVE AGRICULTURAL VALUES

+1976	$165,914,852
*1975	157,762,384
1974	151,245,967
1973	152,492,076
1972	115,140,543
1971	108,725,570
1970	97,533,460
1969	92,773,860
1968	90,363,720
1967	88,016,920
1966	85,737,590

+Preliminary
*Revised

Source: 1976 Agricultural Crop Report, Agricultural Commissioner

a major factor that led to this contraction in production. Preliminary 1977 figures suggest a further decline in numbers due to the drought and a lowering in prices.

Dairy cattle are raised primarily in the Santa Maria Valley, but dairies also are found around Lompoc and in the Santa Ynez Valley. The number of dairy operations has declined in recent years, and production has decreased 23 per cent since 1964. Each year the decline has been relatively steady, averaging 3 per cent annually with increases in production only in the periods 1964-1965 and 1971-1972.

Horses

In 1973, 54 horse ranches were operating commercially in the County. On 40 of these, Arabian stock was raised, while thoroughbreds were raised on the remaining 14. In the Santa Ynez Valley, interest is growing in sport and pleasure horses. Although accurate statistics on the present horse population and recent trends are not available, the County Farm Advisor believes that the Santa Ynez Valley could become the light horse center of Southern California.

Vegetable Crops

The County's vegetable production includes artichokes, lima beans, broccoli, cabbage, carrots, cauliflower, corn, lettuce, peppers, potatoes, pumpkins, spinach, and tomatoes. Most of these truck crops are grown principally in the Santa Maria Valley, but favorable conditions in the Lompoc Plain, the Santa Ynez Valley, and the south coast have encouraged vegetable production there as well. In 1976 the total vegetable crop harvested acreage was 32,885, a slight drop from 1975 figures of 33,696.

Field Crops

Field crops in the County include barley, beans, alfalfa, oats, sillage corn, sugar beets, and wheat. The field crop acreage represents about 1.1 per cent of the total acreage in the state, if non-irrigated pasture is excluded to make the statistics comparable. Preliminary figures show total field crop production for 1976 at 851,641, slightly lower than 1975.

Fruit and Nut Crops

Avocados, lemons, oranges, strawberries, walnuts, and wine grapes are the fruit and nut crops presently grown on over 16,000 acres of land. From 1963 to 1972 the County's orchard and vineyard production was less than 1 per cent of the total production state-wide, but with the recent expansion in avocados and wine grapes, this share should increase. Planted avocado orchard acreage in 1976 was 4,579, with 3,530 acres of bearing orchards. Lemon production has dropped from 55,000 tons in 1975 to 33,155 tons in 1976. Strawberry acreage

increased in 1975 from 642 acres to 738, while walnuts dropped slightly from 1,615 to 1,514 acres. Finally, total vineyard acreage now amounts to about 6,000 acres.

Cut Flowers and Nursery Products

Cut flowers, principally orchids, carnations, chrysanthemums, and gypsophilia, are grown primarily on the South Coast in the Carpinteria area. Over 12 million square feet of production area with 616 field acres is devoted to these products, up from 543 acres 1975. Seed crops are grown on over 8,300 acres primarily around Lompoc and Santa Maria, about 25 per cent less acreage than was utilized in 1964.

1977 Agricultural Production

Preliminary 1977 figures show a record gross value of $190,807,697, an increase of almost $25 million over 1976. Avocados, listed in seventh place the year before, reached first place in 1977, with a crop valued at more than $18 million. Broccoli, with $17.4 million in revenue, and head lettuce, valued at $16.9 million, are listed in second and third place, with cattle and calves, at $16.3 million, placing fourth. Other million dollar products are noted in the 1977 Agricultural Crop Report.

AGRICULTURAL LAND USE

Approximately 120,000 acres of land in the County currently are under cultivation. About thirty-five per cent of this land is devoted to irrigated field row crops. The next most extensive crop type is non-irrigated grain, a category which also includes some dryland beans and other dryland crops but excludes non-irrigated pasture. Irrigated pasture, including alfalfa and forage crops, occupies over 24,000 acres. Citrus, avocado, walnut, and deciduous fruit are grown on 16,300 acres, the bulk of which is found on the South Coast. Seed crops (a category including bean, flower, and vegetable seeds) are produced on 8,300 acres. The newest crop to be introduced in Santa Barbara County is wine grapes, and vineyards now occupy 6,000 acres. Table 3, from the 1975 Agricultural Land Use Survey, Santa Barbara County,* shows agricultural land use within hydrologic units. Agricultural trends may be seen in Table 4, also from the UCSB crop survey.

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*University of California, Santa Barbara, Geography Remote Sensing Unit

TABLE 3: 1975 AGRICULTURAL ACREAGE BY HYDROLOGIC UNIT

HYDROLOGIC UNIT	GRAIN*	FIELD	PASTURE	TRUCK	DECIDUOUS	CITRUS[a]	VINEYARD	SEMI-AG	ORNAMENTAL	TOTAL
Cuyama Basin	7923	180	6044	37	86		187	153		14610
+Nipomo Basin	22	540	544	7585					138	8829
Santa Maria Basin	3824	8402	5447	19525			5121	605	488	43412
Casmalia Sub-Area	628									628
San Antonio Basin	2643	2205	788	1023	5		694	19		7377
Lompoc Sub-Area	541	3656	387	2219	151		9	90	2136	9189
Santa Rita Sub-Area	896	4228	599	745	467		121		516	7572
Buellton Sub-Area	1674	265	1330	613	143		484	33	129	4671
Santa Ynez Sub-Area	5044	900	3537	371	347		240	194	35	10668
Cachuma Basin	269	110	24							403
Surf-Tajiguas Area	638		9	4	105	510				1266
Goleta WD #3	89				34	528				651
Goleta WD #2	202		31	12	109	1322		9	54	1739
Goleta WD #1	3	118	14	209	27	3050		457	103	3981
Santa Barbara, City of		4		4	3	98		223	2	334
Montecito WD Area	21		31	15	8	679	2	516	10	1282
Summerland WD Area						158			2	160
Carpinteria WD Area	12	6	45	63		3106		85	474	3791
Carpinteria Foothills						96				96
+Ventura County						378			50	428
Hydrologic Unit Totals	24429	20614	18830	32425	1485	9925	6058	2384	4137	121,087
‡Santa Barbara County Totals	24407	20074	18286	24840	1485	9547	6858	2384	3949	111,830

* Dry Farmed
\+ Outside Santa Barbara County
‡ Excludes Nipomo Basin and Ventura County Area

[a] The Geography Remote Sensing Unit includes avocados in this category.

TABLE 4

CHANGES IN AGRICULTURAL LAND USE BETWEEN 1966 AND 1975[1]

(In Acres)

	Irrigated Agriculture		Non-irrigated Agriculture	
	'75 Totals	Acreage Change	'75 Totals	Acreage Change
Cuyama Valley	6,534	+ 1,759	7,923	- 2,397
Santa Maria-Sisquoc Valley	38,983	+ 8,588	3,824	- 4,426
San Antonio Valley[2]	4,715	+ 1,585	3,271	- 3,679
Santa Ynez Valley				
Lompoc-Santa Rita	15,234	+ 3,864	1,437	
Buellton-Santa Ynez Cachuma	8,528	- 1,157	6,987	
	23,762	+ 2,707	8,424	- 5,236
Surf to Tajiguas	628	- 1,312	638	- 567
Goleta Valley	5,611	+ 1,306	294	- 191
City of Santa Barbara	111	- 189	0	- 30
Montecito	745	- 170	21	- 19
Summerland	160	- 120	0	- 60
Carpinteria Valley	3,790	- 415	12	- 8
COUNTY TOTALS	85,039	+13,979	24,407	-16,613

1. The above totals do not include the "Semi-Ag" category, so the indicated totals and changes are presumed to more accurately depict planting trends.
2. Casmalia area included.

SOURCE: Agricultural Land Use Survey, UCSB Geography Remote Sensing Unit and Santa Barbara County Water Agency, May, 1976.

AGRICULTURAL SUITABILITY

So far, the analysis of agricultural resources has focused on production and land use without examining the environmental factors that make an area highly productive. It is important to know the agricultural suitability of presently cultivated areas in order to set priorities for agricultural preservation. A systematic assessment of agricultural potential in areas not currently farmed can assist land use planners to identify which lands should be reserved for agricultural expansion. An initial step in gauging the relative suitability of lands for agricultural production is to analyze the natural resource base and potential environmental impacts without reference to market trends for particular commodities. Land values, accessibility to markets and processing plants, and other economic factors affecting the cost of production at a given location also are important, but for comprehensive land use planning they are not the most critical determinants of agricultural land suitability. These issues are examined in the County's agricultural economics study.*

The three major environmental determinants of agricultural suitability are water supply, soils, and climate. In the Water Resources chapter, the availability of water and the distribution of water supplies are discussed in relation to agricultural land use.

Soil resources were analyzed using data from the U.S. Soil Conservation Service and the County Farm Advisor to determine the relative capability of the land for various major crops, and the results are presented in the following section. Climate, while one of the most important determinants of agricultural suitability, has not been analyzed in detail to determine the micro-climatic variations within the County. Climatologists for the National Weather Service have published extensive material on temperature, rainfall, relative humidity, sunshine, and cloudiness and their impact on the growing season in Santa Barbara County. Summaries of these data are available in the soil surveys of the Soil Conservation Service. Because climatic factors are unlikely to affect significantly the land use planning decisions to be made in the Comprehensive Plan, this information is not repeated here. However, in preparing the soils capability classifications, climatic factors have been considered in the relative suitability rankings.

Agricultural suitability is not solely a function of natural resources. The potential environmental impacts on water resources and on ecological systems also affect the relative suitability of an area for agricultural production. Land use planning has to incorporate these factors as well.

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* See University of California, Cooperative Extension, "Economic Impacts of Resource Use," September 1975. Other reports are in preparation.

Soils

Two separate complementary systems of ranking soil capability for major crops are available. County-wide, the U.S. Soil Conservation Service has indicated the soil capability for agricultural production for each soil type. This approach shows quite clearly the potential for most but not all agricultural crops. The capability classifications are employed in the County's agricultural preservation program, described in a later section of this chapter, to determine eligibility for designation as prime land. Because these suitability classes do not always reflect the potential for some of the crops produced in the County, such as avocados, wine grapes, and flowers, the soil series also have been given suitability classifications.

The Soil Conservation Service has defined eight soil capability classes. Classes I and II are considered to be prime soils because they impose few limitations on agricultural production, and almost all crops can be grown successfully on these soils. Limited agricultural soils are grouped into Classes III and IV either because few crops can be grown on these soils, special conservation measures are required, or both of these conditions exist. Classes VI and VII include soils that are suited primarily for rangeland, woodland, and wildlife habitat. Class V, which also falls in this category, is not found in the County. Finally, soils and landforms that are unsuited for agricultural use are placed in Class VIII.

The Soil Conservation Service soil surveys in Santa Barbara County were conducted at two different times. The north County area was surveyed in 1964, and the results were issued in 1972. The South Coast area was surveyed in 1973 and 1974, and field maps were made available for use in preparing the soils maps for the Conservation Element. The soil capability classes were mapped County-wide, and the soil series were mapped in the study areas. Both the soil capability classifications and the soil series information were included in the computer data bank as part of the environmental data system.

The Soils: Agricultural Capability map shows the distribution of lands falling in each of the four capability classes. The acreages are summarized in Table 5. Over 100,000 acres in the County are classified as prime agricultural soils, and another 128,000 are classified as limited agricultural soils.

Santa Barbara County
Soils: Agricultural Capability

Prime Agricultural Soils (Class I and II)

Limited Agricultural Soils (Class III and IV)

Primarily Rangeland, Woodland or Wildlife Habitat (Class VI and VII)

Non-Agricultural Open Space Uses (Class VIII)

Note. Where no data are shown, natural soil types have been altered, and no agricultural capability classification is associated with present conditions.

POINT SAL
PURISIMA POINT
VANDENBERG AIR FORCE BASE
SURF
POINT ARGUELLO
POINT CONCEPTION
GAVIOTA
SANTA BARBARA
MONTECITO
SUMMERLAND
CARPINTERIA
SANTA MARIA RIVER
RIVER
Zaca Lake
LOS PADRES NATIONAL FOREST
SANTA YNEZ RIVER
State Route 154
State Route 166
CUYAMA
SAN LUIS OBISPO COUNTY
KERN COUNTY
VENTURA COUNTY
N
SOILS AGRICULTURAL CAPABILITY

TABLE 5. SOILS: AGRICULTURAL CAPABILITY

Soil Capability Classes	Total Acres County-wide[a]	Per Cent of Total
Prime agricultural soils Class I and II	104,500	12
Limited agricultural soils Class III and IV	128,600	14
Primarily rangeland, wood-land, and wildlife habitat Class VI and VII	555,000	62
Non-agricultural open space uses, Class VIII	104,100	12
Total	892,200	

(a) Acreage computed for computer analysis area only.

Source: U.S. Soil Conservation Service

The County Farm Advisors' Office evaluated the suitability for production for each major crop type in each study area separately and ranked the soil series accordingly. Where slope also is a factor, separate rankings were made for each slope category. The soil series suitability ratings for each of the six major crop types are shown in Table 6.

Environmental Impacts

The environmental impact of modern agricultural operations often can have far-reaching effects. Unfortunately, much research still remains to be done on the impacts of agricultural waste products on air quality, water quality, and ecological systems, as well as on human health.

The problem perhaps is best illustrated by the case of DDT and other pesticidal chemicals which involve not only the accumulation of residues in air, soils, water, and wildlife but also result in increasing concentrations as these residues move up the food chain. Even today, scientists are not in complete agreement on the desirability of banning DDT

TABLE 6. SOIL SERIES SUITABILITY

Suitability
- Unsuitable or not present in area
1 Low
2 Moderate
3 High

Series	Non-Irrigated Crops: South Coast 0-2	Non-Irrigated Crops: South Coast 2-9	Non-Irrigated Crops: Santa Ynez 0-2	Non-Irrigated Crops: Santa Ynez 2-9	Non-Irrigated Crops: Lompoc 0-2	Non-Irrigated Crops: Lompoc 2-9	Non-Irrigated Crops: Santa Maria 0-2	Non-Irrigated Crops: Santa Maria 2-9	Irrigated Grain, Pasture, and Alfalfa: South Coast 0-2	Irrigated Grain, Pasture, and Alfalfa: South Coast 2-9	Irrigated Grain, Pasture, and Alfalfa: Santa Ynez 0-2	Irrigated Grain, Pasture, and Alfalfa: Santa Ynez 2-9	Irrigated Grain, Pasture, and Alfalfa: Lompoc 0-2	Irrigated Grain, Pasture, and Alfalfa: Lompoc 2-9	Irrigated Grain, Pasture, and Alfalfa: Santa Maria 0-2	Irrigated Grain, Pasture, and Alfalfa: Santa Maria 2-9
Aqueda	3	3	3	3	3	3	-	-	3	2	3	2	3	2	-	-
Arnold	1	1	1	1	1	1	1	1	-	2	-	2	-	2	-	2
Ballard	3	3	3	3	3	3	3	3	3	2	3	2	3	2	3	2
Bayshore	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Betteravia	1	1	1	1	-	-	-	-	2	1	2	1	-	-	-	-
Botella	3	3	3	3	3	3	3	3	3	2	3	2	3	2	3	2
Camarillo	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
Chamise	-	-	2	2	2	2	2	2	-	-	2	2	2	2	2	2
Corralitos	-	-	1	1	1	1	1	1	-	-	2	2	2	2	2	2
Cropley	-	-	2	2	2	2	2	2	-	-	2	1	2	1	2	1
Diablo	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-
Elder	3	3	3	3	3	3	3	3	3	2	3	2	3	2	3	2
Garey		-	1	1	-	-	-	-	-	-	1	1	-	-	-	-
Gaviota	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gazos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Los Osos	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Marina	-	-			-	-	-	-	-	-	1	1	1	1	1	1
Maymen	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metz	1	1	1	1	1	1	1	1	3	2	3	2	3	2	3	2
Mocho			3	3	-	-	3	3	-	-	3	2	-	-	3	2
Narlon			1	1	1	1	1	1	1	1	1	1	1	1	1	1
Oceano	-				-	-	-	-	-	-	1	1	-	-	-	
Panoche	-				3	2	-	-	-	-		-	3	2	-	-
Pleasanton			2	2	2	2	-	-	-	-	2	2	2	2	-	-
Positas					1	1	1	1	-	-	-	-	1	1	1	1

Series	Irrigated Truck and Field Row Crops: South Coast 0-2	Irrigated Truck and Field Row Crops: Santa Ynez 0-2	Irrigated Truck and Field Row Crops: Lompoc 0-2	Irrigated Truck and Field Row Crops: Santa Maria 0-2	Irrigated Ornamental Crops: South Coast 0-9	Irrigated Ornamental Crops: South Coast 9-15	Irrigated Ornamental Crops: Santa Ynez 0-9	Irrigated Ornamental Crops: Santa Ynez 9-15	Irrigated Ornamental Crops: Lompoc 0-9	Irrigated Ornamental Crops: Lompoc 9-15	Irrigated Ornamental Crops: Santa Maria 0-9	Irrigated Ornamental Crops: Santa Maria 9-15	Orchard: South Coast All	Orchard: Santa Ynez 0-9	Orchard: Lompoc 0-9	Orchard: Santa Maria 0-9	Vineyard: Santa Ynez 0-30	Vineyard: Lompoc 0-30	Vineyard: Santa Maria 0-30
Aqueda	3	3	3	-	3	2	3	2	3	2	-	-	2	3	3	-	2	2	
Arnold	3	3	3	3	1	-	1	-	1	-	1	-	2	1	1	1	1	1	1
Ballard	-	-	-	-	2	1	2	1	2	1	2	1	2	2	2	2	3	3	3
Bayshore	2	2	-	2	2	1	2	1	-	-	2	1	2	1		1	-		
Betteravia	1	1		-	1	-	1	-	-		-	-	1	2	-		2		
Botella	3	3	3	3	1	-	1	-	1	-	1	-	2	3	3	3	3	3	3
Camarillo	2	2	2	2	2	1	2	1	2	1	2	1	2	1	1	1			
Chamise	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1
Corralitos	-	2	2	2	-	-	-	-	2	1	2	1	-	-	2	2		2	2
Cropley	-	2	2	2	-	-	3	2	3	2	3	2	-	2	2	2	1	1	1
Diablo	-	-	-	-	1	-	1	-	1	-	1	-	2	-	-	-	1	1	1
Elder	3	3	3	3	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3
Garey	-	1	-	-	-	-	3	2	-	-	-	-	-	1	-	-	2		
Gaviota	-	-	-	-	2	1	2	1	2	1	-	-	1	-	-		-		
Gazos	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		1	1	1
Los Osos	-	-	-	-	-	-	-	-	-	-	-	-	1	-		-			
Marina	-	1	1	1	-	-	2	1	2	1	2	1	-	1	1	1	2	2	2
Maymen	-	-	-	-	-	-	-	-	-	-	-	-	1		-		-		
Metz	3	3	3	3	3	2	3	2	3	2	3	2	3	3	3	3	3	3	3
Mocho		3	-	3	-	-	3	2	-	-	3	2	-	2	-	2	3		3
Narlon		-		-	-	-	-	-	-	-	-	-	-	-	-		1	1	1
Oceano	-	1	-	-	-	-	2	1	-	-	-	-		1			1		
Panoche		-	3	-	-	-	-	-	3	2	-	-			3			2	
Pleasanton	-	2	2		-	-	2	1	2	1	-	-	-	2	2		3	3	
Positas		-	1	1	-		-	-		-								1	1

TABLE 6. SOIL SERIES SUITABILITY (continued)

Suitability
- Unsuitable or not present in area
1 Low
2 Moderate
3 High

Series	Non-Irrigated Crops								Irrigated Grain Pasture and Alfalfa								Irrigated Truck and Field Row Crops				Irrigated Ornamental Crops								Orchard				Vineyard		
	South Coast		Santa Ynez		Lompoc		Santa Maria		South Coast		Santa Ynez		Lompoc		Santa Maria		South Coast	Santa Ynez	Lompoc	Santa Maria	South Coast		Santa Ynez		Lompoc		Santa Maria		South Coast	Santa Ynez	Lompoc	Santa Maria	Santa Ynez	Lompoc	Santa Maria
Per Cent Slope	0-2	2-9	0-2	2-9	0-2	2-9	0-2	2-9	0-2	2-9	0-2	2-9	0-2	2-9	0-2	2-9	0-2	0-2	0-2	0-2	0-9	9-15	0-9	9-15	0-9	9-15	0-9	9-15	All	0-9	0-9	0-9	0-30	0-30	0-30
Rough broken land	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	2	1	2	1	-	-	-	-	-	-	-
Salinas	-	-	3	3	3	3	3	3	-	-	3	2	3	2	3	2	-	3	3	3	-	-	3	2	3	2	3	2		3	3	3	3	3	3
San Andreas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	2	2	2
Sandy alluvial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	-	-	-	-	-		
Santa Lucia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	-	1	-	-	-	-	-	-	-	
Santa Ynez	-	-	-	-	1	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	1	
Sorrento	-	-	3	3	3	3	3	3	3	2	3	2	3	2	3	2	3	3	3	3	1	-	1	-	1	-	1	-	3	3	3	3	3	3	3
Stutzville	-	-	1	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	2	-		-	-	-
Tangair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-		-		-		1
Tierra	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1			-	1	1	1
Anacapa	1	1	-	-	-	-	-	-	2	2	-	-	-	-	-	-	1	-	-	-	3	2	-	-	-	-	-	-	2	-	-	-	-	-	
Ayer	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Baywood	1	1	-	-	-	-	-	-	2	2	-	-	-	-	-	-	2	-	-	-	3	2	-	-	-	-	-	-	2	-	-	-	-	-	
Cortina	1	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Hueneme	1	1	-	-	-	-	-	-	2	2	-	-	-	-	-	-	2	-	-	-	2	1	-	-	-	-	-	-	2	-	-	-	-	-	
Milpitas and Positas	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	
Nacimiento	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Sespe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	
Watsonville	2	2	-	-	-	-	-	-	2	2	-	-	-	-	-	-	2	-	-	-	3	2	-	-	-	-	-	-	1	-	-	-	-	-	
Zaca	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	1	-	-	-	-		
Aqueda-Sorrento	3	2	-	-	-	-	-	-	3	2	-	-	-	-	-	-	3	-	-	-	3	2	-	-	-	-	-	-	3	-	-	-	-		
Anacapa-Soboba	1	1	-	-	-	-	-	-	2	2	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	
Lodo-Sespe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-		
San Andreas-Tierra	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-		
Sespe-Lodo	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-		
Xerofluents	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-		

and other pesticides because the alternatives often create equally damaging effects. Over the past several years monitoring activities have increased, but the information base still is not adequate to assess accurately the full range of impacts of agricultural operations in the County. Consequently, the major issues can be raised in this section, but the answers must await further research.

Agricultural production's impact on basin-wide air quality results primarily from debris burning and orchard heaters. Air polluting emissions also come from fuel-burning farm machinery, but an emissions inventory for these particular sources has not yet been compiled. The emissions attributable to agricultural production in Santa Barbara County are summarized in Table 7. With the advent of State and federal emissions control programs for mobile sources and County

TABLE 7. AIR POLLUTING EMISSIONS FROM AGRICULTURAL OPERATIONS IN SANTA BARBARA COUNTY

	Tons Per Day	Per cent of all Stationary Source Emissions	Per cent of Total Emissions
Organic gases	5.4	30	12
Particulate matter	3.3	23	21
Nitrogen oxides	0.2	3	1
Sulfur dioxide	.1	50	16
Carbon monoxide	8.5	71	6

Source: California Air Resources Board, 1970, published in 1972--latest complete figures available.

regulations for stationary source emissions, the proportion of total emissions attributable to agriculture may increase slightly, especially on burn days, but air quality should improve.

Irrigated agriculture, dairying, and feedlots have the greatest impact on water resources of all agricultural operations. The problem of increased mineralization of groundwater, already mentioned in the Water Resources chapter, combined with accumulation of salts in soils can be minimized through sound management practices. Water quality objectives for agricultural uses set by the Regional Water Quality Control Board are being reinforced by implementation of a non-degradation policy permiting no increase in the mineral content of present water. Surface runoff carrying animal wastes from feedlots and dairy farms can degrade water quality if not properly controlled. The American Chemical Society has estimated that each animal produces wastes equivalent to the untreated waste of 4.5 people. With this fact in mind, the problems of waste disposal for large feedlots and dairy operations can present significant problems. Control measures to minimize these impacts are described in the Central Coastal Basin Water Quality Control Plan. The feedlot in Betteravia currently is modifying its waste disposal practices to conform to the Regional Water Quality Control Board's requirements.

Only specific local impacts of agricultural operations on water quality were incorporated into the evaluation of the suitability of lands for agricultural use. Lands tributary to surface water supplies and overlying groundwater basins were rated to show how important these environmental constraints are in determining agricultural suitability. A more detailed discussion of the various categories that have been identified for the protection of local water resources is presented in the Water Resources chapter.

Ecological systems are affected directly and indirectly by agricultural operations. Along many South Coast streams, avocado ranching has increased siltation and encouraged algal growth, contributing to the decline of trout. In the Santa Ynez Valley, overgrazing has prevented the oaks from regenerating. Other examples are discussed in the Ecological Systems chapter. It is important to note that the tolerance-intensity classification system for environmental biology was designed to take into account the potential adverse impacts of agriculture on the County's ecological systems.

The environmental impacts of agricultural operations at the edge of urban areas often are cited as justification for conversion of these lands to urban use. Many contend that intensive agriculture — orchards, irrigated truck crops, and flower crops, for example — is not compatible with urban development. But, until the last several decades cultivated agriculture surrounded most of California's cities, and in many urban areas a harmonious relationship still survives. Many thoughtful people believe that land values and property taxes are the major factors inhibiting the viability of farming close to or intermingled with urban development and that adverse environmental impacts can be minimized through improved operating practices. Obviously, air pollution in urban areas affects crop yields, but County, State, and federal control measures to improve air quality will mitigate this problem substantially. Noise and traffic conflicts caused by agricultural operations can be resolved, albeit at some cost and inconvenience. Similarly, the problems of plant disease and vandalism, upon close scrutiny, are not insurmountable. In the final analysis, the economic and environmental benefits of maintaining highly productive agriculture in and adjacent to urban areas may outweigh the costs of environmental controls necessary to achieve compatibility.

Agricultural Suitability Models

Two separate analytical models were designed to determine the suitability of lands for agricultural use County-wide and in the study areas, taking into account both natural resources and potential environmental impacts. Environmental analysis utilizing mathematical modelling techniques still is an imprecise instrument, and few models have been devised to evaluate systematically agricultural potential by crop type. Relative suitability of lands for agricultural use can be gauged if acceptable assumptions are made about the importance of each environmental factor in determining overall suitability and if cut-off points for different levels of adverse impacts are established. However, these suitability models have not been tested empirically, and the data they utilize are not precise enough to estimate potential crop yields at particular locations. Despite these limitations, agricultural suitability models are valuable tools for comprehensive land use planning because they show where the opportunities for agricultural expansion lie and provide a structure for assigning priorities to croplands for preservation of agricultural use.

In the following discussion of the two agricultural suitability analyses, no reference is made to the computer program procedure utilized. A detailed description of the analytical model steps, the numerical weights assigned to each environmental factor, and the cut-off points for each of the mapped categories is included in Appendices A and B.

The County-wide Model — The objective of this analytical model is to identify and rank areas suitable for agricultural production. All lands in the County are classified in one of seven suitability categories. In this way, the relative suitability of lands presently under cultivation can be compared with that of lands that are likely candidates for agricultural expansion. Areas suitable for irrigated truck and field row crops are distinguished from areas suitable for orchards and vineyards and areas suitable for specialty crops in order to take account of each major crop type's specific requirements. Because urban land use was not included in the County-wide data file, presently urbanized lands have been given suitability rankings too. The major purpose of this model is to assess agricultural suitability of lands outside the study areas, utilizing County-wide environmental data; so the inclusion of urban lands will not distort the planning process.

Agricultural suitability in the County-wide model was determined by three separate indices. The Environmental Resource Index combines the Soil Conservation Service's soil capability classifications with the indices of availability of groundwater. Areas with Class I and II soils and adequate groundwater received the highest score. A Landform Index was computed by combining the data on the proportion of the 92 acre grid cell falling in three separate slope categories: 0-10 per cent slope, 11-20 per cent slope, and 21-30 per cent slope. Flat areas are assumed to be more suitable for irrigated agriculture than extremely hilly areas, while orchards and vineyards generally are viable on slopes up to 30 per cent. The Landform Index was grouped into four ranges to show whether the land in a particular grid cell is predominantly flat, gently sloping hills, rolling hills, or steep slopes. Environmental Constraints, the third index, includes flood hazards, protection of local water resources, the tolerance-intensity classification for environmental biology, and high groundwater. Each of the sub-classifications of these factors was assigned a weight representing the degree of constraint it imposes on agricultural production. The weights then were combined into a summary index for Environmental Constraints. The County-wide Agricultural Suitability map was produced by assigning cut-off points for each index, with lower indices representing lower suitability. The detailed steps for computer programming are presented in Appendix A.

Santa Barbara County Agricultural Suitability for Major Crops

Highly Suitable for Irrigated Truck and Field Row Crops

Highly Suitable for Orchard and Vineyard

Highly Suitable for Irrigated Crops if Surface Water Available

Highly Suitable for Orchard and Vineyard if Surface Water Available

Moderately Suitable for Crop Production

Suitable Only for Certain Crops

Unsuitable for Crop Production

Hydrographic Unit Boundary

Hydrographic Unit

1. Cuyama Valley
2. Santa Maria Valley
3. San Antonio Valley
4. Lompoc Plain
5. Vandenberg Air Force Base
6. Upper Santa Ynez Valley
7. South Coast West of Goleta
8. Goleta
9. Santa Barbara
10. Montecito
11. Summerland
12. Carpinteria
13. Mountains and Balance of County


GUADALUPE
ORCUTT
GAREY
SISQUOC
HARRISTON
LOS ALAMOS
VANDENBERG
AIR FORCE
BASE
LOMPOC
SANTA RITA
BUELLTON
BALLARD
LOS OLIVOS
SOLVANG
LOS PADRES NATIONAL FOREST
NEW CUYAMA
LAS CRUCES
GAVIOTA
POINT
CONCEPTION
SANTA BARBARA
MONTECITO
SUMMERLAND
CARPINTERIA
N
1
2
3
4
5
6
7
8
9
10
11
12
13

This model shows that in the County-wide study area over 33,000 acres of land is highly suitable for irrigated crops, and an additional 34,000 acres are highly suitable if surface water is available. Most of this land is located in the Santa Maria Valley, the Lompoc area, and the Santa Ynez Valley, as one would expect from the current agricultural land use pattern. Lands highly suitable for orchard and vineyard, which also may be moderately suited for irrigated agriculture, include 43,340 acres where adequate groundwater is available and 31,770 acres where supplemental surface water supplies would be required. Limited agricultural soils, Class III and IV, are the limiting factor in these categories. Over 47,000 acres located primarily in the Santa Maria Valley, the Santa Ynez Valley, and the Cuyama Valley are judged to be moderately suitable for cultivated agriculture. Finally, lands that are suitable only for certain crops occupy close to a third of the County-wide study area. Here, opportunities for specialty crops not shown in the other categories might be found.

Land can be shown as unsuitable for agricultural use for several reasons. When no prime or limited agricultural soils are present, the land obviously is unsuitable for irrigated crops. It also would be unsuitable for fruit and nut crops if it is subject to severe environmental constraints. If at least three of the following four conditions exist, an area is considered unsuitable for agricultural use.

— The land is in a floodway.

— The land is tributary to surface water supplies, or overlies unconfined groundwater.

— Ecological communities within the area could not tolerate even moderate intensity agriculture.

— High groundwater is present.

When the County-wide Agricultural Suitability map is compared with the **Agricultural Preserve** map, it becomes clear that most of the highly suitable land already is used for agricultural production or for urban development. However, in the Santa Maria Valley, undeveloped lands near Orcutt have moderate to high agricultural potential. At the head of the San Antonio Valley near Vandenberg Air Force Base, expansion of existing agricultural operations onto lands judged highly suitable might be viable. Similarly, west of Lompoc several hundred acres are shown with high potential provided that surface water is available. The lands shown as highly suitable at Point Conception are subject to

strong winds, and it is unlikely that crops could be grown there profitably, according to the County Farm Advisor. In the hills east of Las Cruces Ranch potential for orchards is indicated, but water supply might pose a problem. Finally, in the Cuyama Valley agricultural expansion onto lands adjacent to existing cropland might be advantageous. In general, it appears that no major areas with high agricultural potential have been overlooked by the County's farmers.

The County-wide Agricultural Suitability map is utilized in preparing the Open Space Element to assist in classifying lands outside of the study areas. Presently cultivated lands will be ranked according to their agricultural suitability to set preliminary priorities for open space designation and preservation programs. Areas not under cultivation or non-irrigated areas capable of being upgraded to more intensive agricultural use will be analyzed in relation to other possible open space functions that they might serve, to determine whether any potential conflict exists or whether these lands can even qualify for an open space designation.

<u>The Study Area Model</u> — A separate analytical model was designed for the urban study areas to identify and to rank lands suitable for intensive cultivation that were not in irrigated crop production in 1971. The 1974 agricultural land use data were not available in time to be included in the study area data files; so some of the areas suitable for agricultural expansion already have been put into intensive cultivation. In these instances, the model still is useful in indicating the relative importance of these areas for preservation of agriculture. Suitability for six major crop types was gauged by utilizing the soil series classifications prepared by the County Farm Advisor and his staff. (See Table 6.) An area might be shown as suitable for more than one crop type, and, for this reason, a composite suitability map was prepared.

The structure of the study area model is similar to the County-wide model except that the information base is at a finer scale. Each grid cell in the study areas is 5.74 acres, while the grid cells County-wide are almost 92 acres. Two separate indices were calculated. The Soil Suitability Index was based on the soil series classifications shown in Table 6, and on the slope in the cell. Each cell was given a rating of suitability: high, moderate, low, or unsuitable.

Because slope was included in this calculation, a Landform Index is not necessary. The Environmental Constraints Index combines the weights assigned to the same environmental factors as considered in the County-wide model: flood hazard, protection of local water resources, tolerance-intensity classification for environmental biology, and high groundwater. Water availability, of course, must be evaluated prior to making final decisions on agricultural expansion.

The greatest opportunities for expansion lie with non-irrigated crops and vineyards if only highly suitable land is considered, and most of the land in these categories is found in the Santa Ynez Valley and Santa Maria study areas. For the three types of irrigated crops and for orchard, the only major potential expansion areas on highly suitable land are in the Santa Maria area. Moderately suitable areas, where soils are less suitable and environmental constraints are greater, are found in larger units in all the study areas, with the greatest acreage lying in the Santa Ynez Valley.

In this category, more land can be used for orchard, irrigated grain, pasture and alfalfa, and irrigated ornamental crops than for any other crop type, assuming that either groundwater or surface water supply is available. Most of the opportunities exist on the South Coast. As one would expect, for each crop type the greatest amount of land falls in the categories of low suitability and suitable with environmental problems.

The following study area maps of Suitability for Agricultural Expansion show the distribution of lands within each of the composite categories. In most instances the isolated uncultivated areas surrounded by agricultural lands (infill areas) now are being farmed, according to the 1974 agricultural land use up-date. In other areas, comparison of existing agriculture with the agricultural expansion potential maps shows that some non-irrigated crop lands have been classified as unsuitable because of environmental constraints. On the individual suitability maps for each crop type, these areas are shown as suitable with environmental problems. However, because the objective of the model was primarily to identify areas of high and moderate suitability for major crop types, specific lands where certain crops might be viable may not be indicated as such on the maps if the environmental factors and soil capability revealed low potential coupled with adverse environmental impacts.

South Coast Study Area ~ East
Suitability for Expansion of Agriculture

- Highly Suitable for Irrigated Crops and Orchard or Ornamentals, or for Irrigated Crops Only
- Highly Suitable for Orchard Only
- Highly Suitable for Ornamentals Only
- Moderately Suitable for Irrigated Crops, Orchard, or Ornamentals
- Low Suitability for Irrigated Crops, Orchard or Ornamentals, or Highly Suitable for Non-Irrigated Crops
- Unsuitable for Crop Production Because of Soil Capability or Environmental Constraints

SUITABILITY FOR EXPANSION OF AGRICULTURE

South Coast Study Area ~ West
Suitability for Expansion of Agriculture

Highly Suitable for Irrigated Crops and Orchard or Ornamentals, or for Irrigated Crops Only

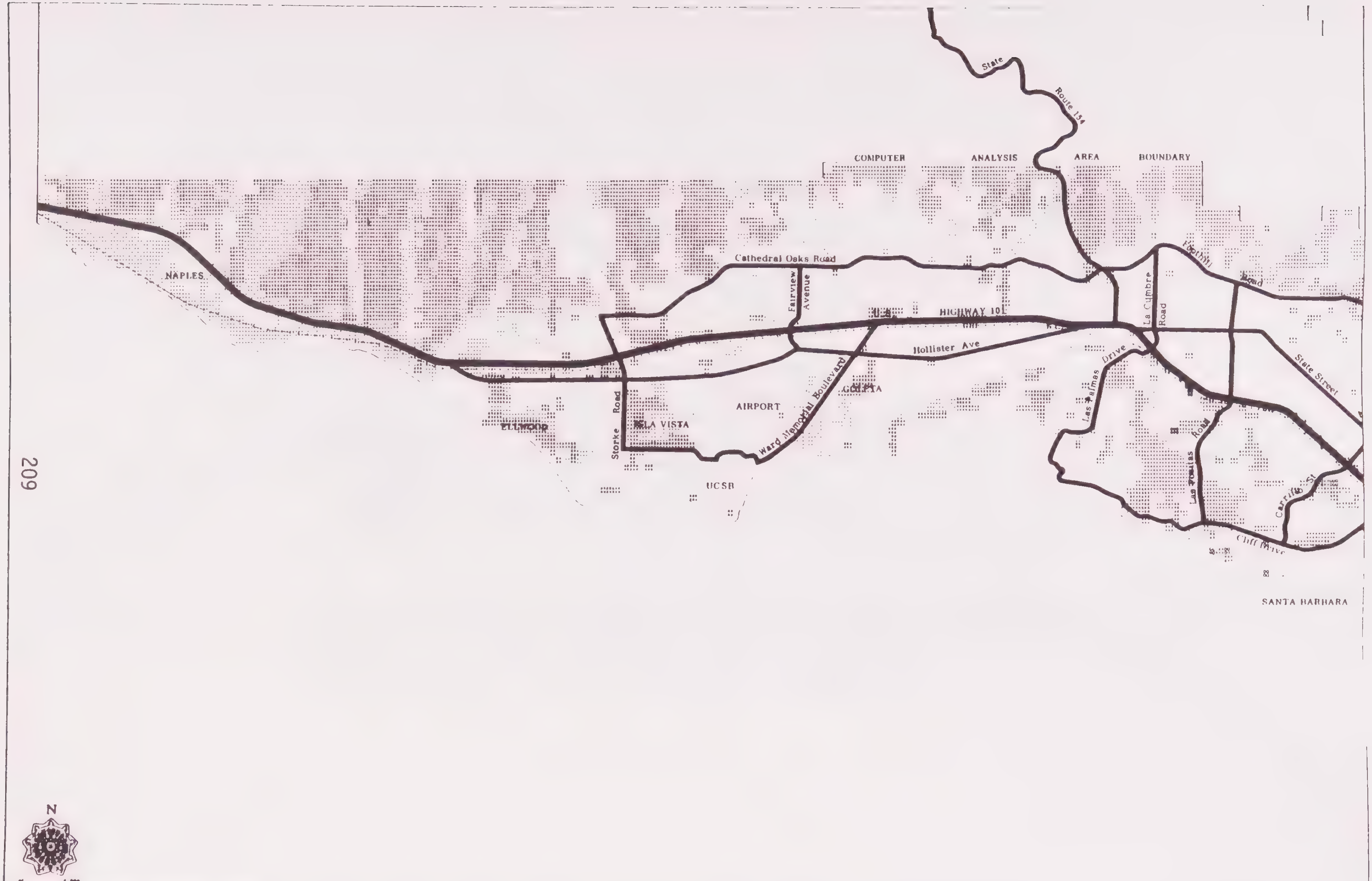
Highly Suitable for Orchard Only

Highly Suitable for Ornamentals Only

Moderately Suitable for Irrigated Crops, Orchard, or Ornamentals

Low Suitability for Irrigated Crops, Orchard or Ornamentals, or Highly Suitable for Non-Irrigated Crops

Unsuitable for Crop Production Because of Soil Capability or Environmental Constraints



SUITABILITY FOR EXPANSION OF AGRICULTURE

Santa Ynez Valley Study Area
Suitability for Expansion of Agriculture

- Highly Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals, or for Irrigated Crops Only
- Highly Suitable for Orchard or Vineyard Only
- Moderately Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals
- Low Suitability for Irrigated Crops, Orchard, Vineyard or Ornamentals, or Highly Suitable for Non-Irrigated Crops
- Unsuitable for Crop Production Because of Soil Capability or Environmental Constraints


COMPUTER ANALYSIS AREA BOUNDARY
STUDY AREA BOUNDARY
U.S. HIGHWAY 101
LOS OLIVOS
BALLARD
Base Line Avenue
Road
Alamo Pintado Road
Refugio Road
Edison St
SANTA YNEZ
State Route 246
BUELLTON
SOLVANG
Airport
SANTA YNEZ RIVER
Alisal Road
N
0'
4,000'
SUITABILITY FOR EXPANSION OF AGRICULTUR

Lompoc Study Area
Suitability for Expansion of Agriculture

Highly Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals, or for Irrigated Crops Only

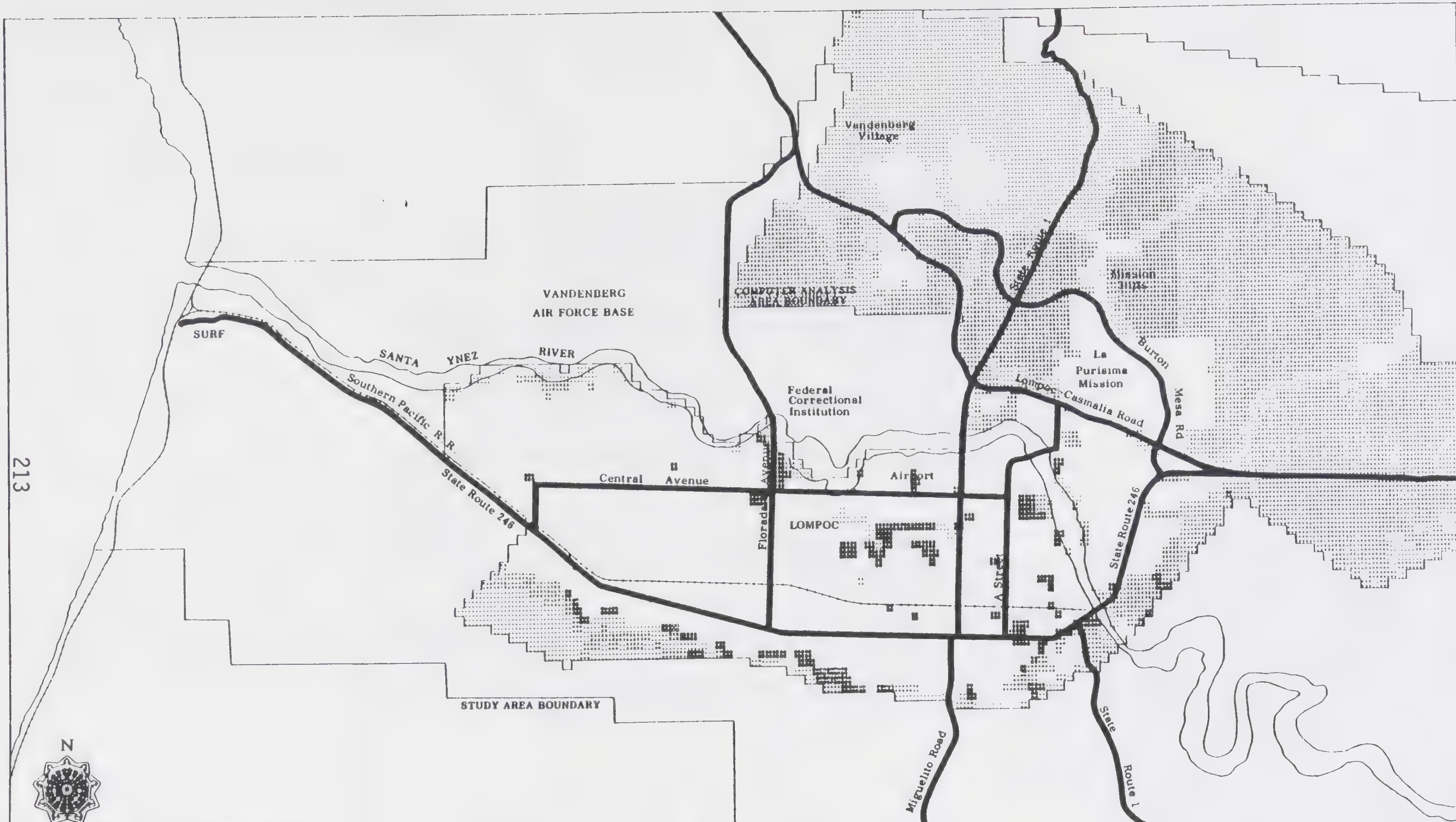
Highly Suitable for Orchard or Vineyard Only

Highly Suitable for Ornamentals Only

Moderately Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals

Low Suitability for Irrigated Crops, Orchard, Vineyard or Ornamentals, or Highly Suitable for Non-Irrigated Crops

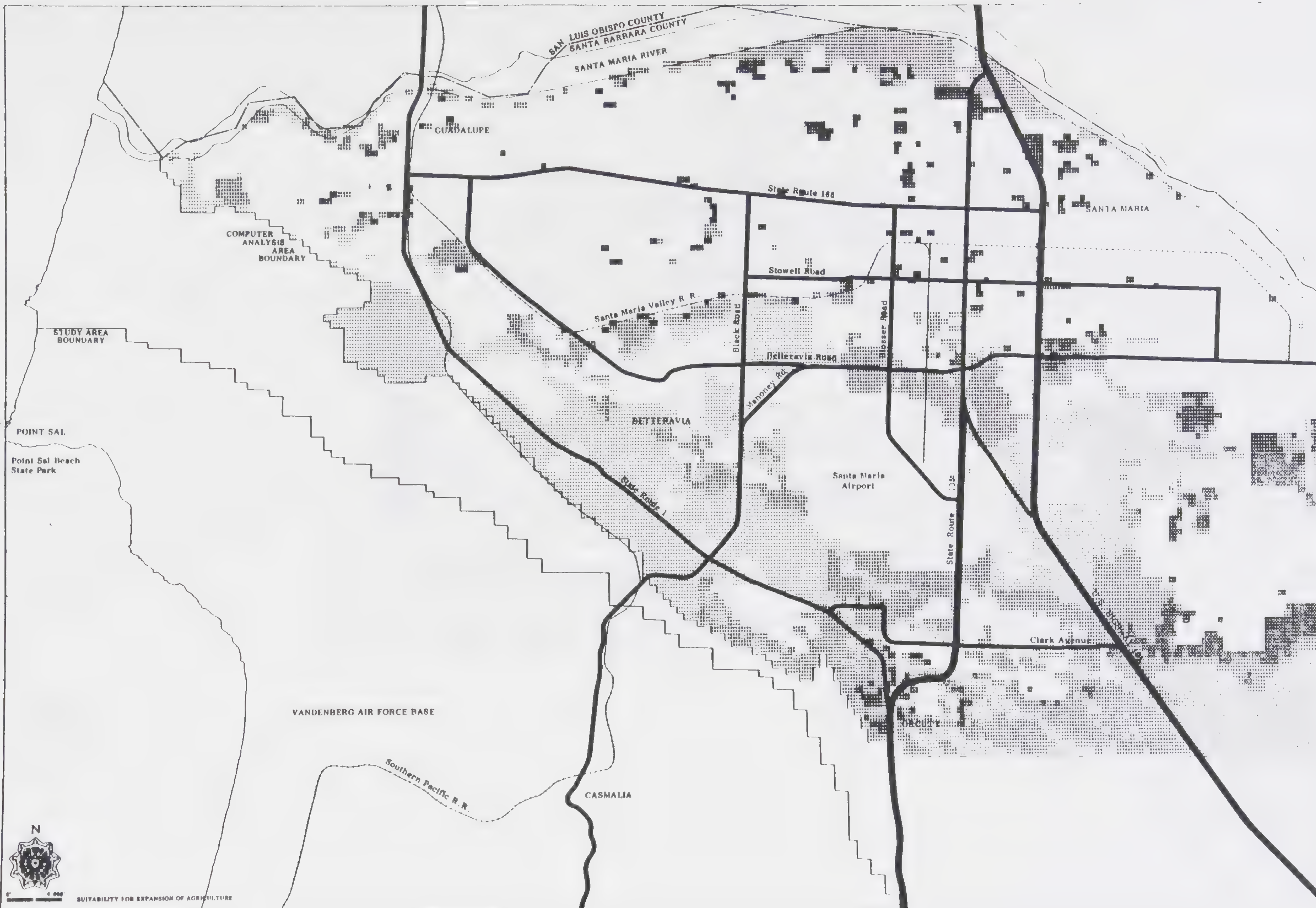
Unsuitable for Crop Production Because of Soil Capability or Environmental Constraints



SUITABILITY FOR EXPANSION OF AGRICULTURE

Santa Maria-Orcutt Study Area
Suitability for Expansion of Agriculture

- Highly Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals, or for Irrigated Crops Only
- Highly Suitable for Orchard or Vineyard Only
- Highly Suitable for Ornamentals Only
- Moderately Suitable for Irrigated Crops, Orchard, Vineyard or Ornamentals
- Low Suitability for Irrigated Crops, Orchard, Vineyard or Ornamentals, or Highly Suitable for Non-Irrigated Crops
- Unsuitable for Crop Production Because of Soil Capability or Environmental Constraints


SAN LUIS OBISPO COUNTY
SANTA BARBARA COUNTY
SANTA MARIA RIVER
GUADALUPE
State Route 166
SANTA MARIA
COMPUTER
ANALYSIS
AREA
BOUNDARY
Stowell Road
Santa Maria Valley R. R.
Black Road
Blosser Road
STUDY AREA
BOUNDARY
Betteravia Road
Mahoney Rd.
BETTERAVIA
POINT SAL
Point Sal Beach
State Park
Santa Maria
Airport
State Route 1
State Route 135
Clark Avenue
ORCUTT
VANDENBERG AIR FORCE BASE
Southern Pacific R.R.
CASMALIA
N
SUITABILITY FOR EXPANSION OF AGRICULTURE

On the South Coast near Carpinteria, most of the potential expansion areas in the hills are judged to be moderately suitable for agriculture. The infill areas are in orchards already. In Summerland, large areas of moderate suitability for all irrigated crops and orchards are indicated. However, some of these areas that already have been put into non-irrigated crop production could be upgraded. The lands around Montecito are judged moderately suitable for agricultural expansion, and in many of these areas orchards now are found. In Santa Barbara, only areas of low suitability remain for agricultural expansion. In Goleta, opportunities for expansion exist in small isolated areas of moderate suitability. Finally, west of Goleta there are extensive areas with moderate and low suitability. Some of these moderately suitable lands might be put into orchards.

In the Santa Ynez Valley, the lands north of Santa Ynez with high agricultural potential presently are in irrigated production, and portions of the moderately suitable lands to the east are in non-irrigated production. In other parts of the Valley, non-irrigated crops can be found on lands of low suitability and on lands with environmental problems. West of Santa Ynez lies an area with high suitability for orchard use only, and some small areas exhibiting high suitability for all irrigated crops. Around Solvang there also are lands that are highly suitable for orchards. Some of the land shown as moderately suitable is used for growing non-irrigated crops. North of Buellton and Solvang, most of the land not being cultivated has moderate to low suitability for all types of crops.

Turning to the Lompoc study area, fewer opportunities for agricultural expansion can be found. North of Lompoc, some irrigated crops and non-irrigated crops are being grown on lands of moderate suitability. In the Vandenberg Village area east of Mission Hills, almost all of the land has moderate agricultural potential. The areas with high potential currently are being cultivated except for sites surrounded by urban development in the City of Lompoc.

The greatest potential for expansion of farming exists in the Santa Maria study area. On the north side and the east side of the City of Santa Maria are lands with high potential for irrigated agriculture. South of the City the potential is only moderate. Recent expansion of non-irrigated crops to the southwest appears to have taken place on lands with environmental problems. Around Orcutt, ornamental crops, orchards, and vineyards could expand onto lands with


MAP SHOWING
AGRICULTURAL PRESERVES
1977
N
no scale
PRIME ACT LANDS
NON PRIME ACT LANDS
GUADALUPE
SANTA MARIA
ORCUTT
CASMALIA
VANDENBERG AIR FORCE BASE
LOS ALAMOS
LOS OLIVOS
BALLARD
SANTA YNEZ
LOMPOC
BUELLTON
SOLVANG
POINT CONCEPTION
GAVIOTA
GOLETA
MONTECITO
SUMMERLAND
SANTA BARBARA
CARPINTERIA
NEW CUYAMA
LOS PADRES NATIONAL FOREST

Williamson Act agreement coverage includes the following types of property:

Allocation	Total Acres	Percent of Total
Homesites	824.30	.18
Urban Prime*	20,919.69	4.53
Prime	30,137.46	6.53
Non-Prime	409,733.47	88.76

*Prime land within one mile of city limits

Source: Agricultural Preserve Advisory Committee, Santa Barbara County Agricultural Preserve Program, 1975.

In the Santa Maria area, the boundaries of the preserves generally lie within one quarter mile of existing urban development, and in certain locations on the west side of the city, the preserves actually adjoin developed areas. Similarly, on the west side of Lompoc, the agricultural preserves are less than a half mile from residential development. On the South Coast, several of the preserves also are quite close to existing development, especially in Carpinteria and in Goleta. This pattern of agricultural preserves in uncommon in other counties because farmers generally have been reluctant to enter into Williamson Act agreements if their land has apparent urban development potential. In Santa Barbara County, as a result of the agricultural preserve program, most of the urban areas already are blessed with the beginning of greenbelts around them.

CONCLUSIONS AND RECOMMENDATIONS

The high productivity of Santa Barbara's agricultural resources has earned the County its standing as an important source of food and flowers for state and national markets. The expansion of agriculture in recent years has been made possible in part because adequate water supplies were available at reasonable prices. As a consequence, the County's irrigated acreage has increased by 25 per cent since 1966. Opportunities for expansion of intensive agriculture exist for all major crops, and the major constraint in the future may be the availability and the price of water. Table 9 indicates current irrigation costs and projected costs through year 2000. (See also Appendix C.)

TABLE 9

PROJECTED IRRIGATION WATER COSTS[a/]

($/Acre-foot)[b/]

	Groundwater[c/]				Cachuma Project				1976 Prelim. Data for State Project Water: Without Subsidy		With Subsidy	
	1975	1980	1990	2000	1975	1980	1990	2000	1990	2000	1990	2000
South Coast	14	15	17	17					204	198	181[a/]	175[a/]
Carpenteria CWD[d/]					45	50	41	30				
Goleta, Montecito, Summerland CWD[d/]					70	50	41	30				
West Goleta[e/]									363	353	262[h/]	252[h/]
Santa Ynez	15	16	19	20								
SYRWCD ID #1[f/]					20	15	12	9				
Lompoc	10	11	12	13								
San Antonio	12	13	15	16								
Cuyama	15	17	20	22								
Santa Maria-Sisquoc	10	11	13	14					42	43	39[i/]	40[i/]

a/ Abstracted from Newton, et al, "The Economic Demand for Irrigation Water in Santa Barbara County," SBCWA, March 1977. The subsidy is hypothetical and was assumed for study purposes

b/ All figures in 1975 dollars, discounted for inflation. The rate of inflation was assumed to be eight percent short term (1975-80) and four percent long term (1980-2000).

c/ Cost to private groundwater pumpers as a function of projected increases in power consumption due to increased pumping lift, and increasing energy cost. Changes in groundwater levels are indicated in the description of each hydrologic basin. Increases in energy costs were forecast using the Pacific Gas & Electric Agricultural Rate as a base except on the South Coast where the Southern California Edison agricultural rate was employed. Energy rates were projected to increase at the rate of two percent per year above the annual rate of inflation. Well pumps were assumed to operate at 60 percent efficiency.

Source: SBCWA, Present and Future Water Needs, October 31, 1977.

Notes to Table 9: (continued)

d/ Basic variable water cost for gravity flow delivery.

e/ Glenn Annie to Tajiguas Canyon.

f/ SBCWA projection.

g/ Subsidy includes 25 percent of SPW capital costs. (assumed for study purposes)

h/ Subsidy includes 25 percent of SPW capital costs and 50 percent of local pipeline distribution costs. (assumed for study purposes)

i/ Subsidy includes 25 percent of SPW capital costs, inclusive of spreading costs. (assumed for study purposes)

Agricultural preservation in the County has been extremely successful to date in placing lands adjacent to urban areas, as well as more remote lands, under Williamson Act agreements. The County and the cities should adopt the following policies to protect and enhance their agricultural resources:

- The Agricultural Preserve Advisory Committee should assess the impact of reducing the acreage requirements for participation in the Agricultural Preserve Program and make recommendations to the Board of Supervisors based on this assessment.

- Mitigation of potential environmental impacts of some agricultural operations should continue to be encouraged.

- The County and cities should assist the Regional Water Quality Control Board in examining the potential affects of agricultural operations and urban wastewater disposal on groundwater quality to minimize potential adverse impacts of some agricultural operations.

- The County and cities should take all measures necessary to protect agricultural lands from urban impacts, e.g. trespassing and theft.

Historic Sites

INTRODUCTION

Santa Barbara's historical heritage is well known for its richness and diversity. Within the County, prime examples of historic sites survive from each of the major periods in California history. The sites of Indian settlements, mentioned briefly in this chapter, are dealt with extensively in the chapter on Archaeological Resources. From the Hispanic era have come the Presidio and the three Missions, as well as many important adobes. The American era, which dates from 1846, also is well represented in the County. One measure of this richness is indicated by the list of over 80 sites in the County found in the State Department of Parks and Recreation's California History Plan. This is twice as many sites per capita as the average state-wide. Local experts have predicted that a comprehensive inventory, now underway, will reveal nearly ten times more examples that enrich the historical heritage of Santa Barbarans as well as other Californians and Americans.

Historic preservation in the County and in California has become increasingly important during the past two decades because of recurring threats of demolition to make way for new development. As a result, the County and the Cities of Santa Barbara, Carpinteria, and Lompoc have created advisory landmark preservation committees. Working in concert with the Board of Supervisors and the city councils, these committees have embarked on local programs of preservation designed to complement existing State and national efforts. At present, the State and national historic preservation programs are obliged to focus their limited resources on the preservation of a relatively few selected buildings deemed to be of greatest significance. If most of Santa Barbara's historic sites are to be preserved for the education and enjoyment of present and future generations, a far greater effort will be necessary than is underway today. For this program to be successful, increased private participation also will be necessary. To date, the study of historic sites has been directed primarily toward those that have been recognized as significant by the local historical societies. These sites have been inventoried, and a map has been prepared showing the locations of 104 sites. The issues of historic preservation also have been analyzed in order to determine what additional steps should be undertaken by the County.

MAJOR HISTORICAL RESOURCES

Before listing all the known historical sites in the County, it might be

beneficial to describe the major ones — those which ranked highest on local historical societies' priority lists. Many of these sites already are protected by State and national preservation programs, which will be discussed subsequently. These descriptions are not intended to narrate the County's local history which already has been extensively and thoroughly documented elsewhere. Instead, the objective is to identify the most important characteristics of these resources that make them valuable and worthy of preservation. In the Implementation Program, alternate means to ensure protection of these sites, as well as all other known historic resources, and to enhance them through appropriate controls on adjacent land uses will be evaluated.

El Presidio de Santa Barbara — Established in 1782 as part of the Spanish effort to secure sovereignty in California, the Presidio of Santa Barbara is the only one of the four presidios in the state that currently is planned to be restored on its original site. Since 1964, the Santa Barbara Trust for Historic Preservation has been working on land acquisition and restoration of the Royal Presidio in cooperation with the State Department of Parks and Recreation. El Cuartel, a soldier's family quarters, and the Caneda Adobe are the sole portions of the original structures still intact. Adjacent properties have been acquired, and the Trust is excavating the Chapel site as an archaeological project. These properties make up what is now designated El Presidio de Santa Barbara State Historic Park. With financial assistance from the State, and from El Presidio Joint Powers Committee composed of representatives of the Trust and City, County and State officials, the Trust is focusing on historical and archaeological research, acquisition of additional properties, and preparation for reconstruction of the original buildings.

Mission Santa Barbara — One of the most graceful and architecturally significant Missions constructed by the Spanish settlers in the early nineteenth century, Mission Santa Barbara truly deserves its title of "Queen of the Missions". The Mission originally was founded in 1786, shortly after the Presidio, by the Franciscan fathers as the tenth of the 21 Missions established in California. The present buildings, a delicate blend of Moorish and Spanish architecture, were built in 1815 to replace the structures destroyed in the 1812 earthquake. Of interest is the fact that this is the only Mission in California where the altar light has never been extinguished.

The Mission Water Works and Grist Mill includes two dams, reservoirs, aqueducts, and a water-powered grist mill. The upper reservoir and

dam, located in the Botanic Gardens, was completed in 1806, while the grist mill and the lower reservoir were not finished until 1827.

Mission La Purisima Conception — The eleventh Mission, founded in 1787 and located north of Lompoc, was an important seat of Mission government in California for eight years in the early nineteenth century. The present buildings, built at a different location after the 1812 earthquake, have been restored by the State, and today the Mission and 966 acres surrounding it are a State Historic Park. Under the State Beach, Park, Recreational, and Historical Facilities Bond Act of 1974, funds will be available for the State Department of Parks and Recreation to purchase 156 acres of land located directly opposite the Mission, thereby preserving the unique historical and environmental quality of the surrounding area. Urban land development would have threatened the scenic quality of the Mission site and might have destroyed archaeological and historical sites in front of the Mission.

Mission Santa Ines — The nineteenth Mission, with its grist mill, was established by the Franciscans at Santa Ynez in 1805. A period of prosperity based principally on ranching lasted until 1850, after which the buildings began to fall into disrepair. However, some portion of the Mission always was habitable and served as a church. Today, in its attractive setting, the Mission is a State Historical Landmark, frequently visited by those interested in early California history.

Carrillo Adobe — Located in the City of Santa Barbara at 11 East Carrillo Street, this adobe (also known as the Joaquin Carrillo House) was built by Daniel Hill, a settler from Massachusetts, for his Spanish bride in 1826. Here in 1833, Isabel Larkin was the first American child to be born in California. Today, very little of the original structure remains because most of the adobe has been restored.

Covarrubias Adobe — This restored adobe at 715 Santa Barbara Street in Santa Barbara is a prime example of Spanish-Colonial architecture. Domingo Carrillo built the adobe in 1817 for his bride, and Mexican officials, including the last Governor, lived in it. In July 1846, the last Mexican Congress was held here.

De la Guerra Adobe — Today, El Paseo is built around one of Santa Barbara's important adobes. The house of Don Jose de la Guerra, the fifth commandante of the Presidio, at 11 East de la Guerra Street was built between 1819 and 1826. The structure houses shops, and the garden and court are used for important civic, cultural, and social events.

Rafael Gonzales, Ramirez, or Vhay Adobe — What local historians have called one of the best examples of California residential architecture of the Spanish era is located at 835 Laguna Street in Santa Barbara. Rafael Gonzales built this adobe in 1825. Today, it is a National Landmark and is judged to have "national significance" in the National Register of Historic Places.

Vincente Ortega Adobe, Arroyo Hondo — In the foothills north of Route 101 between Goleta and Gaviota Pass is an adobe built in the late 1840's or early 1850's by descendants of Jose Francisco Ortega, the founder of Santa Barbara. The adobe remains in its original condition and has not been subjected to restoration. Consequently, it is an extremely important example of early adobe construction. No official landmark status under County, State, or national programs has yet been conferred on this building.

INVENTORY OF HISTORIC SITES

The key to a meaningful preservation program is the inventory of historic and architecturally significant sites. Only after a comprehensive list has been made of the adobes, buildings, and other features of historical or architectural interest, can the County begin to set its priorities for preservation. Because decisions on which structures are to be preserved permanently cannot be made in a vacuum, it is essential to know as much about the relative importance of each candidate for preservation as possible. In order not to duplicate a comprehensive inventory currently being sponsored by the County, this study did not go beyond previously published lists of historic sites; so the list should be viewed as a starting point, and not a comprehensive summary of Santa Barbara's historic sites.

The first step in preparing the inventory for the Conservation Element was to combine the lists of historic sites of the Santa Barbara Historical Society and the State Department of Parks and Recreation. Mr. Robert Gates, Librarian of the Santa Barbara Historical Society, then reviewed the list, eliminated duplications, and indicated which buildings or adobes are no longer standing. He also mapped the location of each site. Subsequent review by other local historians resulted in the addition of several more historic sites.

Two maps of historic sites and features were prepared. On the South Coast Historic Sites map, 62 adobes, buildings, sites, and other

features are indicated, while on the County-wide Historic Sites map, 42 are shown. (Sites shown on the South Coast map are not repeated on the County-wide map.) In the tables facing each map, the geographic area, identification number, and name of the site or feature is listed along with pertinent notes including the status under County, State or national landmark preservation programs. Sites of buildings that recently have been demolished are not mapped, although previously published lists still may include them. On the South Coast map, the historic buildings and sites in the "El Pueblo Viejo" District are indicated on an inset map in order to show their locations more precisely.

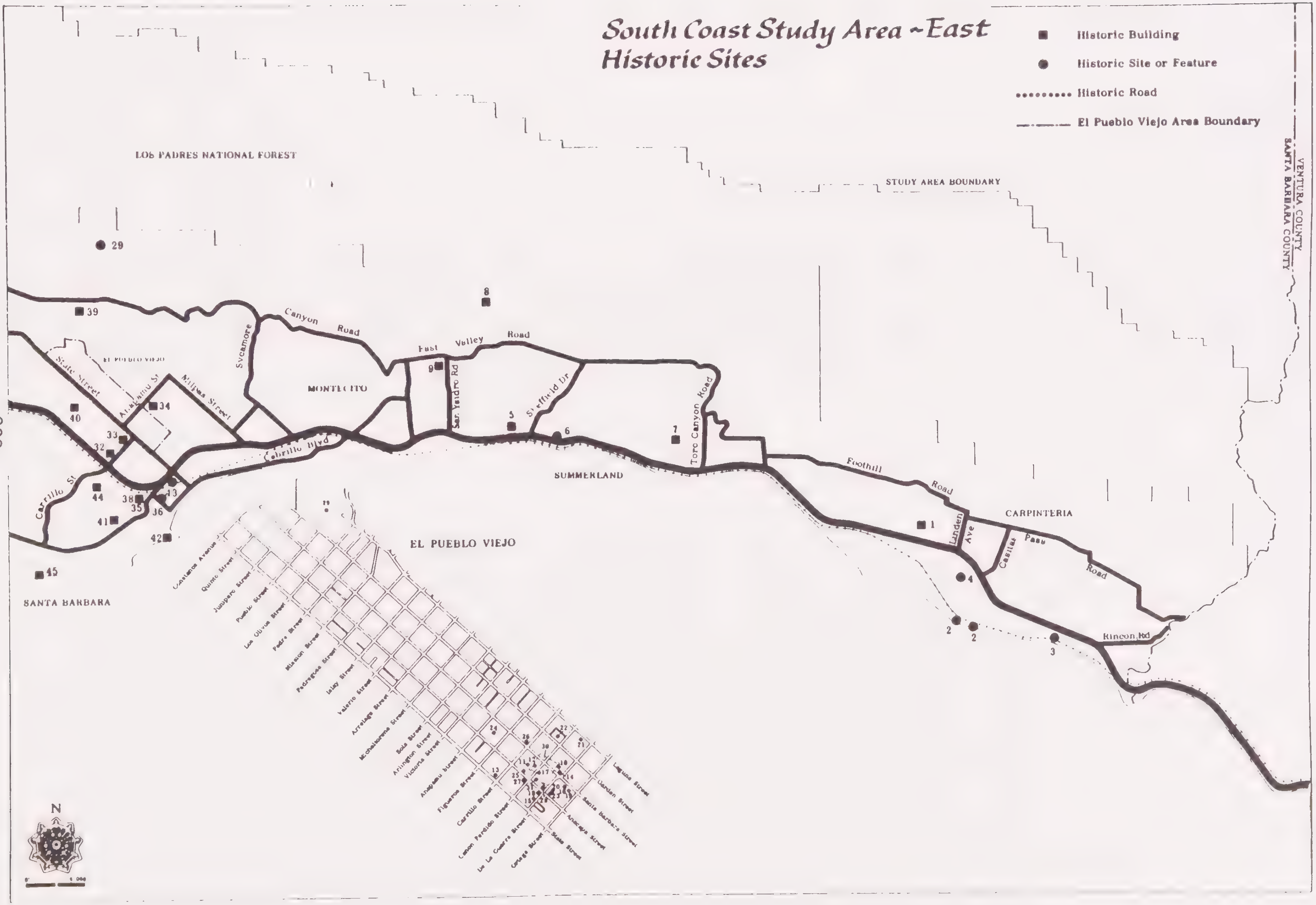
Historical resources in the County can qualify for landmark status under several register and classification programs. The National Historic Landmarks program and the National Register of Historic Places are oriented primarily toward historic places of national significance, although the National Register also maintains a list of places of state or local significance. The register of California Historical Landmarks is compiled by the California Historical Landmarks Advisory Committee, and includes historical features judged to have state-wide significance. The County's program to identify historic landmarks began in 1966 with the establishment of the Santa Barbara County Advisory Landmark Committee.

National Landmarks in the County include the Vhay House (Rafael Gonzales adobe), the Old Santa Barbara Mission, Water Works and Grist Mill, the De la Guerra Orena Adobe, also known as the Los Alamos Ranch House, and La Purisima Mission. However, neither the Vhay House nor the Los Alamos Ranch House are California Historical Landmarks. These four National Landmarks also are included in the National Register of Historic Places which classifies them as having "national significance". The only other sites in the County listed in the National Register are the Presidio and Painted Cave which is categorized as having "state significance".

The California Historical Landmarks Advisory Committee has designated 13 State Landmarks. Two of these (Santa Barbara Mission and La Purisima Mission) also have National Landmark status. In the "El Pueblo Viejo" District of the City of Santa Barbara, the six designated landmarks are the Carrillo Adobe, the Casa De la Guerra, the Covar-

TABLE 1. HISTORIC SITES IN THE SOUTH COAST STUDY AREA

Geographic Area, Map Number, and Name	Notes
CARPINTERIA	
Adobe	
1. Heath	
Historic Sites and Buildings	
2. Carpinteria Tar Pit	
3. Indian Village Site	California Historical Landmark.
4. Torrey Pine at Ward House	Carpinteria City Landmark, over 100 feet high, from Santa Cruz Island 1900.
SUMMERLAND	
Adobe	
5. Massini	
Historic Sites and Buildings	
6. First Oil Well	
7. Fleischmann House	
MONTECITO	
Adobes	
8. Casa San Ysidro	
9. Hosmer	
CITY OF SANTA BARBARA, "EL PUEBLO VIEJO" DISTRICT	
Adobes	
10. Birabent/Rochin	
11. Buenaventuro Pico	
12. Caneda	
13. Carrillo	California Historical Landmark.
14. Casa Arrellanes	
15. Casa de la Guerra	California Historical Landmark.
16. Covarrubias	California Historical Landmark.
17. El Cuartel	California Historical Landmark.
18. Gaspar Orena	
19. "Historic"	
20. Lugo	
21. Ramirez/Gonzales (Vhay House)	National Landmark, "national significance" in National Register.
22. Refugio Cordero	Circa 1825.
23. Santiago De la Guerra	
Historic Sites and Buildings of Historic or Architectural Interest	
24. County Court House	
25. Knox Home	First brick office building.
26. La Rinconada	
27. Lobero Theater	California Historical Landmark.
-- Meridian Studios (20)	Located in front of Lugo Adobe.
28. Miranda Adobe	


South Coast Study Area ~ East
Historic Sites
Historic Building
Historic Site or Feature
Historic Road
El Pueblo Viejo Area Boundary
LOS PADRES NATIONAL FOREST
STUDY AREA BOUNDARY
VENTURA COUNTY
SANTA BARBARA COUNTY
Canyon Road
East Valley Road
Sycamore
State Street
Milpas Street
Anacapa St
MONTECITO
San Ysidro Rd
Sheffield Dr
Toro Canyon Road
Cabrillo Blvd
Carrillo St
SUMMERLAND
Foothill Road
Linden Ave
Casitas Pass Road
CARPINTERIA
Rincon Rd
EL PUEBLO VIEJO
SANTA BARBARA
Laguna Street
Garden Street
Santa Barbara Street
Anacapa Street
State Street
Chapala Street
De La Guerra Street
Canon Perdido Street
Carrillo Street
Figueroa Street
Anapamu Street
Victoria Street
Arlington Street
Sola Street
Micheltorena Street
Arrellaga Street
Valerio Street
Islay Street
Pedregosa Street
Mission Street
Padre Street
Los Olivos Street
Pueblo Street
Junipero Street
Quinto Street
Constance Avenue
N
1
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2
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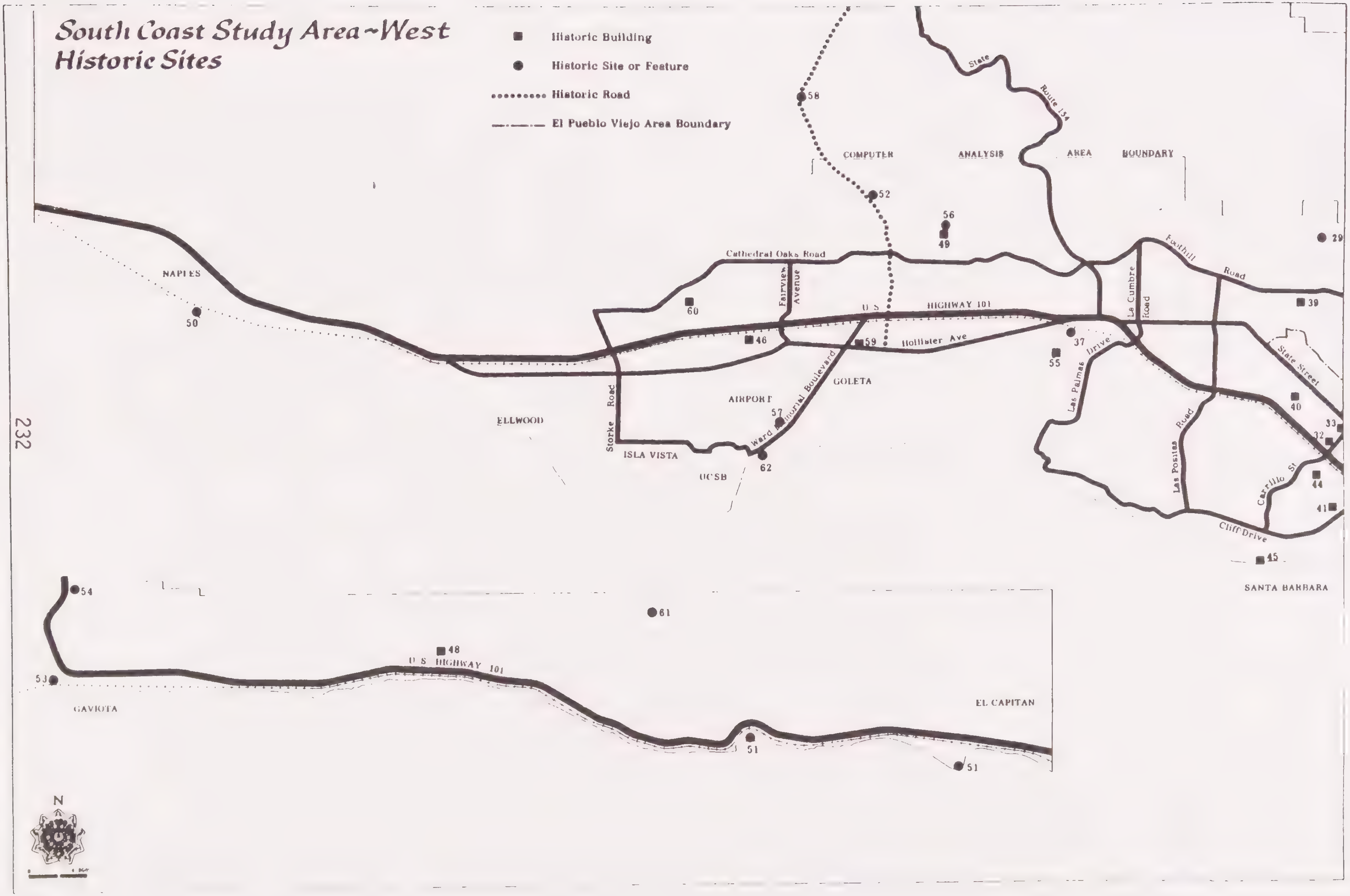
TABLE 1. HISTORIC SITES IN THE SOUTH COAST STUDY AREA (Cont.)

29. Santa Barbara Mission, Water Works, and Grist Mill	National Landmark, "national significance" in National Register, California Historical Landmark.
30. Santa Barbara Presidio	National Register, California Historical Landmark, State Historic Park.
31. U.S. Post Office	
CITY OF SANTA BARBARA	
<u>Adobes</u>	
32. Botiller Monterey Two Story Adobe/Grand Adobe	
33. Bruno Orella	
34. Kirk/Arrellanes	
35. Trussel-Winchester/Hastings	California Historical Landmark, circa 1854.
<u>Historic Sites and Buildings</u>	
36. Burton Mound	California Historical Landmark.
37. Cieneguitas Indian Village and Chapel Site	
38. Fernald House	Victorian, 1860-1.
39. Glendessary Home	
40. Henry Penry House	Oldest brick house in Santa Barbara.
41. Hunt/Stambach House	Barber, Architect.
42. Mispu	Prehistoric site, Indian and Hispanic eras.
43. Moreton Bay Fig Tree	Protected by City Tree Ordinance.
44. Peshine House and Chapel	
45. Santa Barbara Lighthouse	
SANTA BARBARA TO GAVIOTA PASS	
<u>Adobes</u>	
46. Daniel Hill	
48. Vincente Ortega	
<u>Historic Sites and Buildings</u>	
49. Cathedral Oaks	
50. Dos Pueblos	Prehistoric sites.
51. El Refugio and El Capitan Beach Parks	
52. Fremont Oak Tree	
53. Gaviota Landing	
54. Gaviota Pass	California Historical Landmark, State Historic Park.
55. Hope Home	Santa Barbara County Landmark.
56. Largest Bay Tree in the World	Old San Marcos Pass Road.
57. Mescalitan Island Area	
58. Old Stage Road (Slippery Rock)	
59. Sexton House	Victorian.
60. Sherman Stow House	Santa Barbara County Landmark.
61. Tajiguas Ranch	Restoration of Ortega Adobe.
62. Whaling Camp	

South Coast Study Area~West Historic Sites



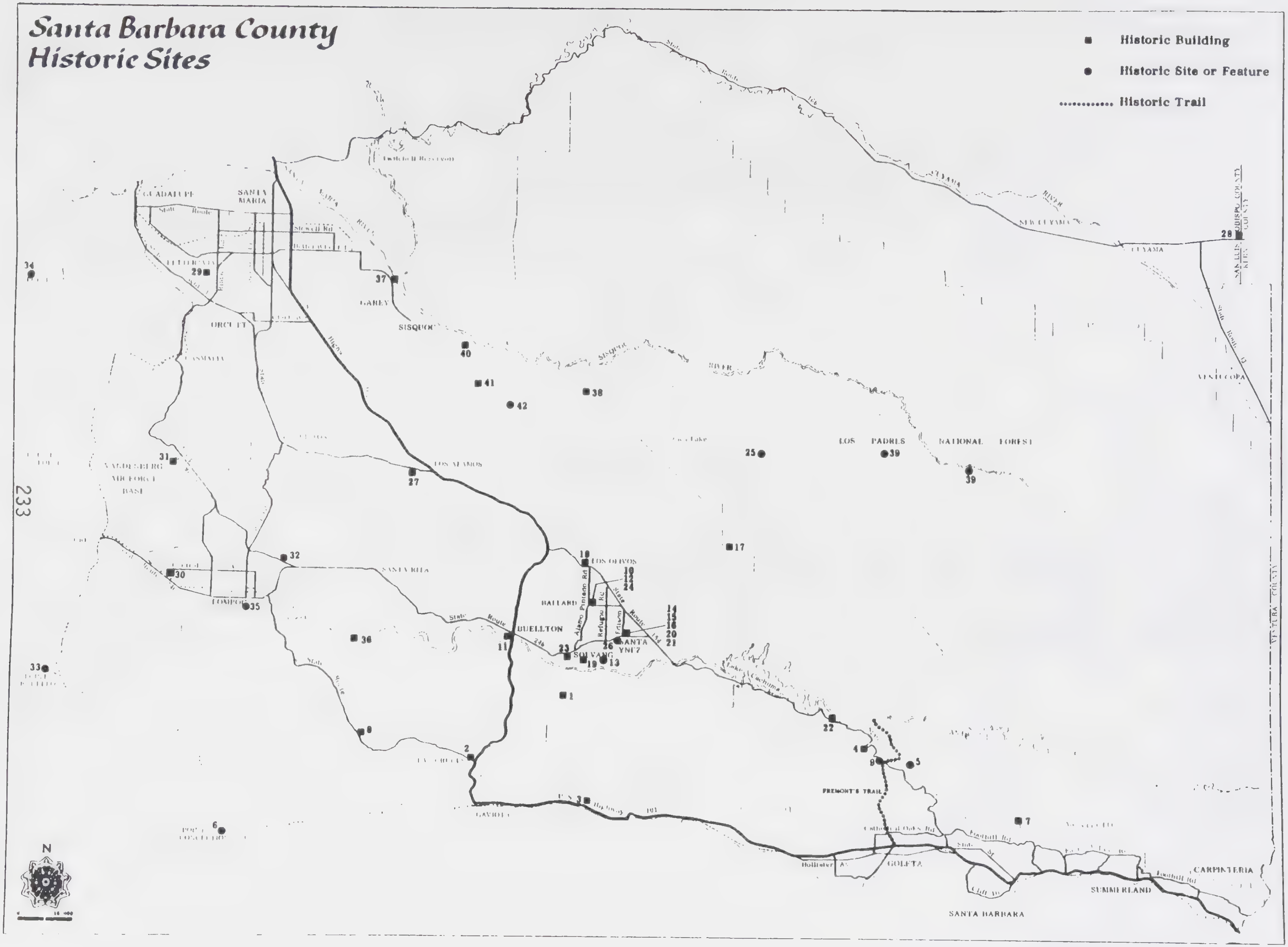

Santa Barbara County
Historic Sites
Historic Building
Historic Site or Feature
Historic Trail
GUADALUPE
SANTA MARIA
ORCUTT
GAREY
SISQUOC
LOS ALAMOS
LOS OLIVOS
BALLARD
BUELLTON
SOLVANG
SANTA YNEZ
LOS PADRES NATIONAL FOREST
SANTA RITA
LOMPOC
GAVIOTA
FREMONT'S TRAIL
GOLETA
SANTA BARBARA
SUMMERLAND
CARPINTERIA
NEW CUYAMA
CUYAMA
VENTUCOPA
VENTURA COUNTY
Alamo Pintado Rd
Refugio Rd
Edison
State Route 154
Hollister Av
N

TABLE 2. HISTORIC SITES IN SANTA BARBARA COUNTY

Geographic Area, Map Number, and Name	Notes
SOUTH COAST	
Adobes	
1. Alisal Ranch Headquarters	
2. Cordero	
3. Vincente Ortega Adobe Ranch	Arroyo Hondo.
Historic Sites and Buildings	
4. Cold Spring Tavern	
5. Painted Cave	"State significance" in National Register.
6. Point Conception Lighthouse	
7. Rattlesnake Canyon Dam	An old Mission dam.
8. San Julian Ranch	
9. San Marcos Pass Kinevan's Stage Coach Stop	
SANTA YNEZ VALLEY	
Adobes	
10. Ballard Stage Station	
11. De la Cuesta	Built by Dr. Roman de la Cuesta.
Historic Sites and Buildings	
12. Ballard School	Santa Barbara County Landmark, circa 1883.
13. College Ranch	First college in the County.
14. Edsell and Strahan Grocery	
15. Hartman's Grocery	
16. John Miller House and Tank	Circa 1888.
17. Marre Ranch	
18. Mattei's Tavern	
19. Mission Dam and Water Works Ruins	Site of Indian Springs.
20. Original Santa Ynez Jail	
21. Ruff Brothers Hardware	
22. San Marcos Ranch Ruins	Restoration potential.
23. Santa Ines Mission	California Historical Landmark.
24. Santa Ynez Presbyterian Church/Ballard Church	Santa Barbara County Landmark, circa 1898.
25. Site of Davey Brown Cabin	
26. Zanja Cota Indian Reservation	Original reservation on Hunt property.

TABLE 2. HISTORIC SITES IN SANTA BARBARA COUNTY (Cont.)

LOS ALAMOS	
27. De la Guerra Orena Adobe/Los Alamos Ranch House	National Landmark, "national significance" in National Register.
CUYAMA	
28. Alexis Godey Adobe	
BETTERAVIA	
29. Elizalde Adobe	
LOMPOC AND SANTA MARIA AREA	
30. Artesia School	Santa Barbara County Landmark.
31. Jesus Maria Rancho Adobe	
32. La Purisima Mission	National Landmark, "national significance" in National Register, California Historical Landmark; State Historical Park.
33. Point Arguello	Historic shipping point.
34. Point Sal	
35. Site of Original Mission	
36. Santa Rosa	
SISQUOC AND TEPUSQUET AREA	
Adobe	
37. Santa Maria	Built by Juan Pacificao Ontiveras.
Historic Sites and Buildings	
38. Manzana School	Santa Barbara County Landmark.
39. Sanctuary for Condors — Hurricāne Deck	
40. Sisquoc Church/Foxen Memorial Chapel*	Santa Barbara County Landmark.
FOXEN CANYON	
Adobes	
41. Frederick Wickenden	
42. Site of Benjamin Foxen Adobe	

rubias Adobe, Santa Barbara Mission, Santa Barbara Presidio, and the Lobero Theater. The Captain H.G. Trussell-Winchester or Hastings Adobe and Burton Mound are the two other State Landmarks located in the City of Santa Barbara. The remaining State Landmarks, not previously mentioned, are Gaviota Pass, the Indian Village Site in Carpinteria, Mission Santa Ines, and "well hill 4" near Santa Maria (not mapped).

Only eight County Landmarks have been designated. The Hope Home and the Sherman Stow House are located on the South Coast. Two County Landmarks can be seen in the Santa Ynez Valley, the Ballard School and the Santa Ynez Presbyterian Church. The Artesia School (a County historic site) is in the Lompoc Area. South of the Sisquoc River, the Manzana School is in Schoolhouse Canyon, and the Dabney Cabin (not mapped) is on Manzana Creek. The Sisquoc Church is in the Tepusquet area north of Foxen Canyon.

In the past few years, interest in Victorian buildings and more recent buildings of architectural or symbolic interest has grown. In the city of Santa Barbara alone, 14 buildings have been suggested to the City Landmarks Committee as being worthy of preservation because of their aesthetic value:

Arlington Theater
El Castillo
El Centro
El Paseo
El Presidio (an office complex)
Historical Society Museum
La Arcada Building
Mortimer Cook House
Museum of Art
Museum of Natural History
San Marcos Building
Savoy Hotel
Southern Pacific Railroad Station and Roundhouse
St. Anthony's Seminary

Buildings of architectural or aesthetic interest, including many churches and residences, also can be found elsewhere in the County especially on the South Coast, but thus far, a systematic survey has not been completed.

A review of current efforts to compile inventories of historic places will put the lists in Tables 1 and 2 in perspective. In the California History Plan published in 1973*, over 3,000 historic features are listed, representing the results of the State Department of Parks and Recreation's Phase I inventory. Only 72 of these sites are located in Santa Barbara County. In Phase II, currently underway, it is anticipated that more than 50,000 historic places will be added to the inventory. It is estimated that as many as 1,000 sites will be included in the County inventory, of which perhaps 500 will be prehistoric and Indian sites. None of the prehistoric and Indian sites will be mapped, in order to prevent looting and destruction.

Each of the six historical societies in the County is preparing a list of sites for a separate area of the County: Carpinteria-Summerland, Santa Barbara-Montecito, Goleta, Santa Ynez, Lompoc, and Santa Maria-Cuyama, utilizing forms and procedures prescribed by the State Department of Parks and Recreation. The inventory process is designed to produce information on the ownership and physical condition of the resource, its relation to historic events, and its significance. Where possible, data on the original design and date of construction, historic and present use, present environment, and threat of destruction also will be supplied. Once the local area inventories have been completed, the County Coordinator and the County Advisory Landmark Committee will review them and forward to the State completed forms on those places approved by the Committee for entry in the State-wide Inventory of Historic Sites. The criteria for selection of sites in this survey include both historic association and architectural merit. Specifically, the local historical societies are asked by the State Department of Parks and Recreation to consider the following factors taken from published criteria of the National Trust for Historic Preservation in preparing their inventories:

> Architectural merit and historical association are the bases for selecting buildings in a survey. Structures might have important associations with historic figures or have been the scene of important events. They may illustrate architectural types or periods or represent the works of known architects or craftsmen. Evidence of coherent planning and design, harmonious proportions,

*Updated in March 1976

good scale and well-designed interiors also serve to indicate architectural value. Structures that illustrate the development of American architecture regionally or nationally or that relate to distinctive historical contributions of cultural or ethnic groups deserve consideration. Properties that have remained in their original condition should be recorded because they illustrate precisely a given period. Structures unique in design or detail or that are surviving examples of a period or style are of interest, as well as neglected building types such as factories, railroad stations or shops. If several buildings are of equal architectural interest, the one with the most known history should be inventoried. Give priority to identifying and recording significant structures threatened with demolition or alteration. Take care to achieve a reasoned mix of building periods and types to present a balanced view of an area.

Upon completion of the Phase II State-wide Inventory of Historic Sites, the County will have sufficient data to embark upon a more comprehensive preservation program designed to complement the State program.

PRESERVATION PROGRAMS

One way to gain a perspective of the need to launch an intensified historic preservation program as soon as possible is to look at the number of buildings that have been demolished over the past 10 to 15 years. Since the Santa Barbara Historical Society's list was prepared in the sixties, three houses and five adobes have been lost. In the City of Santa Barbara, the Sexton Victorian House, the Broome Victorian House, the Packard House, and the Dover Adobe are no longer standing. In the Santa Ynez Valley, two adobes have been destroyed: the Janin and the Don Agustin Janssens. In Guadalupe, the two story Arrelanes Adobe was demolished in 1958 and the Diego Olivera Adobe finally collapsed because it had not been maintained. Whatever the reasons were that rationalized destruction of these historical resources (and, in certain instances, they may have been valid) it nonetheless is unfortunate that these buildings were not covered by a preservation program. Even though the State Department of Parks and Recreation, the County, one of the cities, or a private foundation might not have decided to purchase any of these buildings in the final analysis, the period of time that a preservation program would have given to responsible public agencies

and private organizations to find an alternate means of preservation might have kept the bulldozers away permanently from one or more of them.

The County's historic preservation program's primary purpose is to protect and enhance historic sites. Under County Ordinance 1716, the Advisory Landmark Committee can designate landmarks of historic or architectural significance and can impose restrictions on the owners of these landmarks in order to ensure their preservation. All actions of the Landmark Committee are subject to confirmation by the Board of Supervisors, or else they have no effect beyond 90 days. Unfortunately, the Committee has not used this authority since 1970, but the County's recent renewed interest in the Committee's activities may counter this trend.

The Committee may limit the use of a County Landmark to protect it. Because the environment of an historic site often is as important as the site itself, the Committee may regulate land uses in the vicinity of a County Landmark and prohibit construction, destruction, or alteration of adjacent buildings or structures as may be necessary to ensure the Landmark's preservation and enhancement. If any of these conditions is imposed, it also must be confirmed by the Board of Supervisors to remain in effect for more than 90 days.

In addition, the Landmark Committee can recommend to the Board of Supervisors that it purchase historical properties or acquire the development rights of such properties. The Board is empowered to take such an action if it would be necessary or expedient under the County's preservation program. For example, if the owner of an adobe of historic significance wanted to develop his property, the County could purchase the property, or it could pay the owner the difference between the value of the property in its present use and its fair market value assuming it could be developed as permitted in the zoning district in which it was located. Under the second alternative, the County would purchase the development rights from the owner, but he would retain ownership of his adobe and would be permitted to remodel it in accord with conditions set by the Committee and approved by the Board of Supervisors.

Under State Law (Government Code, Sections 50280-50289), the County can enter into a 20 year historical properties contract with a qualified property owner that will give the owner the benefits of an assessment

based on the restricted use of his property. This contract is automatically renewable annually in the same way that a Williamson Act agreement is. Historical properties that qualify for this kind of tax treatment are California Historical Landmarks that meet the criteria of the California Historical Landmarks Advisory Committee and one of the following four conditions as well:

— The property is the first, last, only, or most significant property in the County or region.

— The property is associated with an individual or group having a profound influence on California history.

— The property is a prototype or example of a period, style, architectural movement, or construction technique, or is a notable example or best surviving work of an architect, designer, or master builder.

— The property is listed in the National Register of Historic Places.

Commercial properties can qualify for historical properties contracts as long as the aims of the County and State's preservation programs are met. County Landmarks, however, are not eligible under the law at present.

In the absence of a landmark designation and restrictive conditions, the County has very limited power to prevent a property owner from altering or destroying a building or feature of historic or architectural significance. Only in the environmental impact assessment process would direct and indirect threats to historic sites be identified. Moreover, the findings of an environmental impact report are not binding on the County. A project that alters or destroys an historic or architecturally significant site can be permitted for overriding social or economic reasons.

CONCLUSIONS AND RECOMMENDATIONS

The County's historically and architecturally significant sites and features represent valuable links with the past and should be preserved. To date, 25 landmarks have been designated under County, State, and national preservation programs, and the City of Santa Barbara has created a Landmark Committee and adopted preservation regulations. However, over the past 15 years an equal number of significant sites probably have been significantly altered or destroyed. The County Advisory Landmark Committee, which has been relatively inactive over the past several years, has the potential to play an important role in the County's preservation program and should renew and expand its efforts. The historic sites inventory presently being conducted by the local historical societies for the State Department of Parks and Recreation will provide an important information resource for the County, once it is completed. To strengthen existing preservation programs, the County and the cities should adopt the following policies.

— The County should retain the period of time, prescribed in County Ordinance 1716, during which a County Advisory Landmark Committee designation and restrictive conditions remain in effect without Board of Supervisors' confirmation for 90 days in order to allow more time for alternate means of preservation to be evaluated.

— The Santa Barbara County Advisory Landmark Committee should evaluate the Historic Sites Inventory of the Conservation Element in order to determine which sites qualify for a County Historical Landmark designation, and should recommend that the Board of Supervisors approve such designations along with appropriate restrictive conditions. When the County-wide Historical Sites Inventory for the State Department of Parks and Recreation has been completed, the Committee also should review this information and should recommend County Landmark designations for qualified sites and features.

— Present environmental impact assessment procedures should be revised in order to require a detailed evaluation of direct and indirect impacts on any site or feature included in the County's Historic Sites Inventory and an analysis of alternate means for preservation by the County Advisory Landmark Committee.

- Qualified property owners should be encouraged by the County Advisory Landmark Committee to enter into historical properties contracts with the County to ensure permanent preservation of historically or architecturally significant sites.

Archaeological Sites

INTRODUCTION

In order that the findings and recommendations of the archaeologists be understood in their proper context, brief summaries of relevant topics are presented below.

Early Archaeology in California

Records of the earliest European contacts with the Indians of Alta California convey an impression of aboriginal homogeneity. The Mission Fathers were somewhat better equipped to observe cultural variability among California Indians, but surprisingly little information is contained in their records. Pre-professional ethnography (Baumhoff, 1958), such as that done by Powers (1877) and Bancroft (1883), began what was to become a trend toward classifying Indian groups by their differences and similarities. Professional ethnography continued this classification effort.

The most significant professional ethnography in California was done by Kroeber and his students in the thirty years following the turn of the century. Their work on ethnographic classification was carried out with a sense of urgency. A major goal of their work was to record as much ethnographic information as possible before the Indians and their culture were completely destroyed by modern civilization.

As a result of this goal, the archaeology of California was almost entirely neglected during this period. Unfortunately, the forces that were eradicating Indian civilization were also destroying archaeological sites, the data base for prehistoric studies.

Special Characteristics of Santa Barbara County Archaeology

The Chumash were the historic Indian population of Santa Barbara County. By all early accounts, they were a numerous group with a well-developed material culture and social organization. Archaeological research has confirmed these early impressions of the Chumash and their predecessors. These data have provided the justification for the opinion that the Chumash were the most advanced Indian group in California.

The extraordinary status of the Chumash has attracted the layman

since the early days of American occupation (c. 1850). The artifacts collected from coastal and large interior sites are displayed in museums in the United States and abroad. The rock art found in back-country rockshelters has also been a focal point of popular interest in the Chumash Indians.

Archaeological material left by the Chumash is currently being used to test theories of cultural evolution. The range of current special research topics related to explanation of the development of Chumash culture is wide.

Archaeological sites as a data base are also important for future research. The trajectory of future research is difficult to predict, yet the data must be preserved for future problem solution.

In sum, the Chumash were an advanced group of Indians. Popular interest in their history and artifacts is extensive. The archaeological record left by the Chumash is critical for present and future research.

Early Archaeology in Santa Barbara County

Early archaeology in Santa Barbara County and in the rest of California was of very poor quality and, except for a few instances, is unusable for present research concerns of archaeologists. The work of R. L. Olson (1930) and D. B. Rogers (1929) in the coastal strip of the Santa Barbara Channel and the Channel Islands contributed to the prehistoric equivalent of classificatory understanding achieved by the ethnographers in the preceding thirty years. The great bulk of subsequent archaeological research in the same area has been geared to filling out the understanding achieved by Rogers and Olson (Horne, 1974: 1).

Archaeological work in the interior of Santa Barbara County is extremely limited in scope (cf. Harrington, 1927; Rogers, 1935, Snow 1935a, 1935b; Strong, 1935). The primary objective of interior archaeology in the County has been directed toward cave archaeology and rock art (Horne, 1973: 2-3). Relatively little work in the interior has concentrated on patterns of site distribution or on understanding variability in the known population of sites. Very recently, the University of California at Santa Barbara, California State University at Northridge, and the U.S. Forest Service have

begun systematic studies in the interior. The data derived from this work is currently being studied, and no results have yet been published.

In sum, the archaeology of Santa Barbara County is best known through unsystematic investigation of the coastal area and known only through a precariously small sample in the interior. The resulting limited state of knowledge constrains our ability to predict accurately areas of probable site locations or to assess accurately the archaeological potential of a given area.

Status of the Archaeological Resources of Santa Barbara County

The Indians of Santa Barbara County and the modern population of the same area show preference for the same general locations, although factors causing these similar population distributions are probably different (Heizer, 1960:9). As a result, present populations have damaged many archaeological sites. The rapid attrition of the archaeological data base has caused concern among archaeologists. The California State Archaeological Task Force (Moratto, 1973:2) has estimated that 50 per cent of all archaeological sites in California have been destroyed. The same group estimated that 81 per cent of archaeological sites in Santa Barbara County have been destroyed (Moratto, 1973:18). The rate of destruction has increased with the acceleration of development in the County since 1960. Although the estimated percentage of destroyed sites in the County appears too high, all archaeologists would share the opinion that a significantly high percentage of sites are no longer available for research. The rapid erosion of the data base for archaeology has forced archaeologists to expend effort toward the preservation of the remaining archaeological resources of the County.

Since the data base for archaeology is in clear jeopardy and since archaeological sites are a non-renewable resource, archaeologists regard the remaining sites as the non-living equivalent of an endangered species.

Professional Assessment of the Importance of Archaeological Sites

Professional guidelines governing the assessment of the importance of archaeological sites are stated below:

— Archaeological sites are a non-renewable resource.

— All remaining archaeological sites are of equal importance; each represents part of a system of cultural development and adaptation. Priority for site excavation should not be confused with the importance of an archaeological site.

— The state of preservation of archaeological sites is not a relevant variable for assessment of the importance of an archaeological site; all archaeological sites contain information which can contribute to the reconstruction of the prehistory of Santa Barbara County.

— Historic cemetery sites (less than 200 years old) must not be disturbed in any manner (excavation, construction, looting).

CLASSIFICATION OF SITE DENSITY AREAS

All of the information on archaeological resources classified for this report was obtained from the files of the Department of Anthropology at the University of California at Santa Barbara. Such files are not considered to contain adequate information for specific project areas, nor to be complete for any of the areas delimited. Most of the survey work which has been carried out in Santa Barbara County has, to this point, been random and unsystematic, with the exception of a few recent studies.

Utilizing available data, archaeological resource areas in the County were mapped. The map is not included in this publication because of the necessity of keeping sensitive information regarding site locations out of public hands. However, a copy of the map is on file with the County for use in preparing Environmental Impact Reports and otherwise evaluating applications for development permission. Each region delimited as an archaeological resource area was given three designations. The first is an acronymic label for each region (e.g., Sierra Madre Ridge is designated SMR). A topographic classification was deemed necessary because the type of adaptation represented in archaeological sites and the density of such sites varies according to environment. The second designation is topographic and consists of three classes:

1. Mountain ridge

2. Valley bottom
3. Coastal strand

The third designation indicates the density of archaeological sites in the region. Two classes of density are included:

1. High density: greater than one site per square mile
2. Low density: less than one site per square mile

Based on this system of classification, Sierra Madre Ridge, which is located in a mountainous area and contains a high density of sites, would be designated SMR-1-1.

In many cases, the boundaries for each region were based on available data and should not be interpreted as conclusive. Three mapping factors affected the boundary and density designations:

— Several sites scattered over a wide area and known only by means of unsystematic survey were grouped as a unit. This usually resulted in a designation of "low density" for that region. In many cases, further systematic survey would likely reveal additional site locations, resulting in a change in density designation.

— Two or more high density areas located nearly adjacent to one another were grouped as a unit. This often necessitated including areas between them which, to our knowledge, have not been surveyed and therefore contain no known sites. This practice tended to lower the calculation of site density.

— Smaller regions in which a few sites were densely clustered were simply circled. The smaller such a unit, the greater the error in density classification.

Sections of the map which do not have acronymic, topographic, and density designations have not been surveyed. It should not be assumed that these sections contain no archaeological resources, only that no information is available.

DESCRIPTION OF DENSITY AREAS

For the same reason that the map of archaeological site areas has not been published, specific descriptions of their locations which appear-

ed in the archaeologists' report have been deleted from this published version. The original report is on file with the County.

South Coast (SC) - Coastal - High Density — The South Coast represents one of the most important archaeological regions in California. This is the area most densely occupied by the Chumash at the time of Spanish contact, and archaeological evidence confirms that it was so occupied for a considerable period of time. Site density in the area is very high, although the area has not been systematically surveyed. Probably 90 per cent of the remaining sites directly on the coast have been recorded, chiefly by Rogers (1929). However, areas just a few hundred yards away from the coast are not well known, although they can be considered high density areas on the basis of what is known about the Santa Barbara-Goleta foothills.

San Marcos Pass (SMP) - Mountain - High Density — This area has not been systematically surveyed. San Marcos Pass is known from historic records to have been a major Indian trade route between the coast and the Santa Ynez Valley. Sites in the area are predominately rock-shelters, and pictographs are reported from a number of locations.

Upper Santa Ynez River (USY) - Valley - High Density — The area to the east of Lake Cachuma has been intensively surveyed (Horne, 1973) and has yielded a remarkable number of sites, as has the environs of the lake itself. Presumably, a large number of sites are now under the waters of the lake. Consequently, the protection of those sites which are still available to us is imperative to the understanding of archaeology of this region. Unsurveyed areas of the valley to the east and west of this region will quite likely turn out to be high density, as well as many of the canyons around the lake area.

Solvang (S) - Valley - High Density — This area includes historic sites associated with the Mission, a probable protohistoric (i.e., active shortly before or at the time of Spanish contact) village site, and some possibly related smaller sites. The preservation of historic and protohistoric Indian remains is important in the study of the impact of more complex European cultures on the Chumash. The entire length of the Santa Ynez River is probably high density, but large sections of this area have not been even casually surveyed.

Happy Canyon (HC) - Mountain - High Density — The only portion of this area that has been adequately surveyed is the region around

Cachuma Camp, but casual survey of Happy Canyon indicates that the entire canyon is high density.

Pendola (P) - Mountain - High Density — The high site density of this small area supports the hypothesis that the entire length of the Santa Ynez can be considered high density. Surveys of intervening areas probably would connect this area with the Upper Santa Ynez high density region, as well as with the Juncal Ridge region.

Juncal Ridge (JR) - Mountain - High Density — See Pendola.

Zaca Lake (ZL) - Mountain - High Density — Zaca Lake is not only high in site density, but represents a special adaptation to unusual environmental conditions. Historic occupation is known for the Zaca Lake area. It is the only example of this type of adaptation in Santa Barbara County, and as such, every effort should be made to preserve these archaeological resources.

Hurricane Deck (HD) - Mountain - High Density — The Hurricane Deck area presents many interesting archaeological problems. At present, however, the area is subject to heavy recreational use, with resulting destruction of sites by vandals and looters. Fortunately, many of the sites in the area are located away from the main trails. This, in combination with the difficulty of the terrain in general, serves to discourage all but the most intrepid looters.

Sierra Madre Ridge (SMR) - Mountain - High Density — This area was subjected to intensive systematic survey in 1973. It is an area of remarkably high density and includes many pictograph sites. From extant data on Sierra Madre, Hurricane Deck, and Santa Barbara potrero areas, it is plausible to assume that much of the wilderness area contains a high density of archaeological sites. The U.S. Forest Service plans to open this area shortly to recreational use. Such use will undoubtedly subject the sites in the area to heavy damage and looting. Alternatives to this should be closely examined.

Santa Barbara Potrero (SBP) - Mountain - High Density — This area is delimited by the grassy vegetation of the potrero. It is an area of high density which, with further survey work, will probably be linked to the Sierra Madre Ridge area to the northwest, and the Santa Barbara Canyon region to the northeast.

Davey Brown Canyon (DBC) - Mountain - High Density — An historical interior village is known in this area, as well as related smaller sites. Sunset Canyon is environmentally distinct and may be of importance, although it has not been surveyed, and is therefore not included in this region.

Potrero Seco (PS) - Mountain - High Density — The area is a mountainous region adjacent to the Ventura County line.

Santa Barbara Canyon (SBC) - Mountain - High Density — See Santa Barbara Potrero.

Vandenberg (V) - Coastal - High Density — The Vandenberg region has been subjected to intensive survey over the last few years by Larry Spanne of Alan Hancock College (Spanne 1974). Spanne's investigations have revealed a very high density of sites on Vandenberg Air Force Base and in adjacent areas. As very little is known at present of the archaeology of the northwestern portion of the County, every effort should be made to ensure the protection of sites in this area

Birabent Canyon (BC) - Mountain - Low Density — This region is little known, and as is true of many of the low density areas presented here, may prove to be of higher density with adequate survey.

Santa Cruz Creek (SCC) - Mountain - Low Density — Very little is known of this region as no systematic survey has been carried out.

Nojoqui Summit (NS) - Valley - Low Density — Nojoqui Pass is another known Chumash trade route, and the region includes pictograph sites. Protection of this area for further research should contribute much to our understanding of the Chumash.

Rancho San Julian (RSJ) - Mountain - Low Density — Very little is known of this area.

Lompoc (L) - Valley - Low Density — Although this region is designated as low density, archaeological knowledge of the district is sparse and it is probable that more sites exist here. See Upper Santa Ynez River, Pendola.

Point Conception (PC) - Coastal - Low Density — A few sites from this area are known, but it is probable that more exist. Once again, with adequate survey of the intervening region, it is probable that

the entire coastline of Santa Barbara County can be linked into one large high density zone.

THREATS TO ARCHAEOLOGICAL RESOURCES

Archaeological sites are a non-renewable resource. In Santa Barbara County archaeological resources include shell middens, rockshelters, lithic scatters, caves, pictographs, and petroglyphs, each of which represents separate and distinct activities of the aboriginal inhabitants. In order to understand the importance of the following recommendations for site preservation, the nature of present and potential threats to archaeological sites must be recognized.

Site Destruction: General

Any alteration of the surface of a site constitutes destruction to some extent. Such alterations include both surface collection by amateurs and modifications of the ground surface. Destruction of archaeological sites is accelerating rapidly. Since 1960, 16,000 sites have been destroyed in California alone, and the estimated per annum rate of disstruction is 1,400 (Moratto, 1973: 4). This does not mean that sites which have already been partially destroyed are less important than those which are well preserved. Partially destroyed sites still contain information relevant to studies of prehistoric populations.

Threats to archaeological sites can be classified into two groups, direct and indirect. The former includes actual alteration of the land upon which a site is located. The latter refers to increased access to an area or alteration of the surrounding area so near a site that the site may eventually be destroyed. For documented examples of site destruction in California, see Moratto (1973).

Direct Threats to Sites

Urban growth and agricultural development are primary sources of direct site destruction. Such activities include, but are not limited to,

- Plowing
- Buldozing
- Residential construction
- Industrial construction
- Grading for roads and highways

Construction of parking lots
Construction of airstrips
Construction of railways (Moratto, 1973; King, Moratto, and Leonard, n.d.; Spanne, 1974).

Any activity which involves building directly on the surface of a site or running vehicles over a site poses a direct threat of destruction. Other examples of such direct destructive factors include:

Cattle grazing
Water projects (eroding and burying sites)
Off-road vehicles
Recreational developments
Natural forces (water and wind)
Unauthorized collecting of artifacts (Moratto, 1973; King, Moratto, and Leonard n.d.; Spanne, 1974).

Indirect Threats to Sites

One of the most significant indirect threats for the destruction of archaeological sites is public access. Vandalism has always been a source of destruction to sites, and it becomes greater with increased access to areas of archaeological significance. Examples of factors contributing to vandalism of archaeological resources include increase in temporary or permanent population in the vicinity of a site through construction of housing projects, trailer parks, campgrounds, or recreation areas; construction of roads which are open to the public (or opening up of previously restricted roads) providing access to areas of archaeological significance; and publication of known site locations or areas of site density.

Activities which alter the immediate environs of archaeological sites provide a second type of indirect threat. Re-directing stream channels and construction (of the types listed under Direct Threats) which may increase or stimulate erosion are examples of such potential destruction.

The relative seriousness of these threats varies depending on topography, population density, facility of access, and numerous other factors. In the past, mining, agriculture, and logging were of primary significance as destructive forces (Moratto 1973: 3). At present, urbanization and public access appear to be the principal sources of site destruction.

CONCLUSIONS AND RECOMMENDATIONS

In order to assure the preservation of a full cross-section of sites representing the various adaptations in time and space of the prehistoric and historic occupants of Santa Barbara County, the following general recommendation is made. Preservation of archaeological resources should not be biased toward a single topographic or environmental class or toward sites of a particular time period. Therefore, it is necessary to evaluate archaeological sites and their settings on an individual basis. No general guidelines can legitimately be prescribed for the archaeological importance of any particular area without on-the-spot evaluation by a competent local archaeologist. (A list of approved archaeologists in Santa Barbara County is available from the Office of Environmental Quality, County of Santa Barbara, from the Department of Anthropology, University of California, Santa Barbara, and from the Santa Barbara Museum of Natural History.)

As local archaeologists are more familiar with the needs and problems existing in an area, they are better qualified to evaluate the importance of any particular site in their area. The problem of qualifications is a difficult one. For instance, field experience alone does not qualify an individual to properly evaluate archaeological sites. Some degree of graduate training in method and theory also is necessary. This is the reason why the list of archaeologists was prepared.

The following recommendations are made with reference both to general urban expansion in the County and to development of specific project areas:

— Once the most likely direction of urban growth has been determined from the Comprehensive Plan, those archaeological site areas most likely to be subjected to development should be systematically surveyed. Such surveys would provide information on the nature and location of sites that would be useful to planners and developers before modification begins.

For specific project areas, the following steps should be taken:

— A systematic ground survey of the project area and alternative areas should be carried out by the archaeologist selected. Preliminary testing of sites within the designated construction area may be included.

- A report should be submitted by the archaeologist to the planners and developers concerned with the project and to responsible government agencies. This report should include details on surface and sub-surface finds, evaluation of the area and the sites it may contain, and suggestions for further actions concerning archaeological resources.

The following list of recommendations presents suggested ways in which archaeological studies may be incorporated into corporate, private, and public projects. They are listed in descending order of preference (adapted from King, Moratto and Leonard n.d.):

- Archaeological sites may be incorporated into parks or landscaped areas in such a way that no damage will be done to the archaeological materials.

- Areas with archaeological sites may also be designated as limited use areas where they can be protected from vandalism. For either of these first two alternatives, a preliminary survey and surface collection by a competent archaeologist must be carried out prior to any action. Buffer zones adjacent to these sites may be necessary, but the extent of such a zone must be determined for each site.

- Outdoor museums are a feasible alternative to destruction when the nature of the archaeological remains is such that their careful excavation and preservation by professionals would prove attractive to the public. This alternative would be of value to the public relations of many private firms, and would serve to increase the awareness of the County's prehistory among both residents and tourists. A museum of this sort might consist of a simple tin roof and fence protecting ongoing or completed excavations and appropriate displays of artifacts. Painted Cave is an example of how this approach has been implemented in Santa Barbara County.

- One method of preserving sites for future archaeological investigation is through the use of extensive land fill. If sites scheduled for possibly damaging use could be covered with sufficient clean fill to avoid damage, such sites would be preserved.

- Salvage excavation is a last resort in the "preservation" of archaeological information. Such short notice excavations destroy relevant information which might be more effectively excavated with future improved archaeological methods and techniques. In salvage archaeology, it frequently is impossible to generate an adequate research design before excavation is commenced. Considering these factors, the loss of valuable information is inevitable. In addition, salvage operations are expensive undertakings. Consequently, every effort should be made to preserve, rather than excavate, endangered archaeological sites.

Other recommended approaches which might increase the protection and preservation of archaeological resources include:

- Public purchase and protection of representative sites from each topographic class (King, Moratto and Leonard n.d.: 15).

- Granting of tax relief to private owners protecting archaeological resources (King, Moratto, and Leonard n.d.: 15). Protection should include no alteration of the ground surface of any archaeological site, and no surface or subsurface collecting by private owners or the public. If this approach is implemented, specific guidelines for private protection of sites can be obtained from archaeologists at the University of California, Santa Barbara.

- Action by the County to preserve and protect known historic cemetery sites (less than 200 years old). Such a policy has been legislated by the State but initiative taken by County officials would ensure enforcement of the law.

- Designation of high density archaeological resource areas as Historical Monuments. Applications for placing such areas on the National Register of Historic Places presently are pending in Santa Barbara County.

- Development of public education programs which would include general information on the prehistory of Santa Barbara County,

with emphasis on the importance of archaeological sites as a data base for further understanding of the aboriginal inhabitants. Such a program might decrease the rate at which archaeological resources are destroyed by vandalism.

Conservation and Energy

Energy conservation suggests the judicious development and rational use of resources important for maintaining an acceptable standard of living. The relationship between energy and conservation, in other words, suggests that the production of energy resources and the consumption of these resources are two sides of the conservation coin.

Santa Barbara County is somewhat unique in the sense that more energy is produced in the area than is consumed. If measured in terms of British Thermal Units (BTU's), for example, onshore Santa Barbara oil and gas production yielded 93 trillion BTU in 1977, while consumption in the form of natural gas, electricity, and gasoline amounted to 49 trillion BTU.

The realities of energy development and consumption, however, dictate that both the production of energy resources and the use of these resources will require difficult decisions for local, state, and federal policy-makers. Although the decisions pertaining to energy conservation will increasingly require an understanding of the close relationships between production and consumption, these two aspects of energy conservation will be treated separately in this discussion.

PRODUCTION

As depicted in Table 1 of the Mineral Resources Chapter (p. 175), Santa Barbara County onshore oil and gas production has been declining. Whether this trend will continue is difficult to determine. Nevertheless, it is possible (and useful) to delineate the factors which are certain to influence production rates.

To some extent, the decline of production is a reflection of the fact that many fields are relatively old, suggesting that they are reaching the point of depletion. Yet the rate and extent of decline have been heavily influenced by a wide range of international, national, and local developments. By the late 1960's, for example, Santa Barbara oil and gas (as elsewhere in the U.S.) were more costly to produce than the cheaper and more plentiful resources being developed throughout the world. With the rapid escalation of prices for foreign oil during the early 1970's, domestic oil resources became more competitive.

If price were the only consideration, one could expect that domestic oil production would have reversed its historical decline rather quickly. Higher prices for oil should have encouraged the exploration of oil and gas in Santa Barbara County (both offshore and onshore). Similarly, the increased value of oil and gas could be expected to stimulate production from existing fields through the use of enhanced recovery techniques.

The fact that domestic oil, and particularly California crude, has not responded to this apparent opportunity for revival can be attributed to a variety of regulatory and environmental constraints during the 1970's. The nature of these constraints is best understood by looking at the extraction, processing, and marketing stages of oil production.

EXTRACTION

Most of the oil in Santa Barbara County is both "heavy" and "sour," meaning it is low gravity and high in sulfur content. Because of its low gravity, continued production of most of Santa Barbara County oil requires the use of enhanced recovery techniques, typically steam injection (the heat from the steam being necessary to increase the flow of the oil). This operation frequently requires a considerable consumption of fuel. In some cases as much as one barrel of oil is consumed for every two barrels produced under steam injection. The use of steam injection methods can also result in a significant increase in emissions from oil field operations.

An additional problem faced by oil producers in recent years has been a dramatic rise in the cost of electricity, necessary to operate oil well pumps. Although information on Santa Barbara oil production electrical costs is not available, it has been estimated that electrical costs in the Long Beach area have escalated 300 percent in recent years, the single most important increase in operation costs.

PROCESSING

The "heavy" and "sour" characteristics of Santa Barbara oil also make processing difficult. Although this oil could be refined into higher quality products, such as gasoline and low sulfur fuel oils, most refineries in California are not equipped to refine the heavier and high sulfur crude oil into anything other than asphalt or lower grade fuel oils.

The willingness and ability of refiners to accept and process heavy, sour crude has been highly dependent on the federal government's "entitlements policy," whereby refiners are paid subsidies to purchase oil which otherwise would have been economically unattractive. The entitlements-permitted California crude proved insufficient to make it an economically viable proposition. Moreover, West Coast refiners have been flooded by Alaskan and Elk Hills oil. The result has been a glut of oil on the West Coast, with California oil being the least attractive source of oil, since it tends to be heavier and more sour than other sources, and because the entitlements program did not provide adequate subsidies to the refiners.

The existing glut of heavy fuel oils on the West Coast is likely to continue for the near future, while much of the rest of the U.S. and the world is looking for oil. Somewhat ironically, production of oil from older onshore fields has been restricted by federal pricing policies, while pressures increase to develop oil in offshore federal lease areas.

MARKETING

The "heavy" and "sour" characteristics of Santa Barbara and California crude have produced additional problems at the consumer stage. The ability to market heavier fuel oils, the cheapest and most logical product for California crude, has been made difficult not only because of the new surge of supplies mentioned previously, but because of existing environmental restrictions on the consumption of these fuels. The electric utility companies are a large consumer of fuel oils, but growing air quality concerns have led to restrictions on the percentage of sulfur content permitted in the fuel consumed. The result has been an increasing dependence of West Coast refiners and utility companies on low-sulfur oil sources, notably Indonesia.

Because of problems associated with extraction, processing, and consumption of California oil, production of Santa Barbara County oil has not responded to the opportunities arising from the worldwide increase in the price of petroleum. By 1977-78, the problem became one of not only continued decline in production, but the threat of production being "shut-in." Some 200-300 wells were reported shut-in in California. Only a few of these occurred in Santa Barbara County, but a number of other operators felt compelled to restrict production.

Belated action on the part of the federal government finally came in 1978. Since the prospect of losing California oil production contradicted the stated federal objective of increasing domestic production, the Department of Energy has taken several steps to remove a number of the obstacles mentioned above. The entitlement program was restructured to permit greater incentives to refiners to accept the heavier California crude, and exemptions have been granted to permit the "export" of California crude to refineries elsewhere in the U.S. which have a need for this crude. Several measures of the pending National Energy Plan are likely to continue or extend the incentives necessary to encourage California oil production.

With the removal of many of the constraints, oil production in the County can be expected to reverse its decline and could conceivably lead to both an expansion of production in existing fields and an interest in new development. Opportunities for expansion could exist in both the North County inland areas as well as along the Coast.

It is at this point that the County will play an important role in the future of mineral resources in the area. Expansion of production is almost certain to be accompanied by the use of enhanced recovery techniques, particularly steam injection. If steam injection is based on current technology, such production will have significant air quality implications. In general terms, the two stated objectives of the Conservation Element (p. 181) - to encourage oil and gas development yet protect the environment - will come into conflict.

At a minimum, effective planning at the County level should include a coordination of oil developments in the inland areas, the coastal areas, and offshore. Since the County will be facing the prospects of new oil development in all these areas simultaneously, and since developments in one area could impact those in other areas, coordination will be essential. This is particularly true in terms of proposals for new oil-related facilities. Since much of the new activity onshore and offshore will be located in the North County, the County may be presented with new opportunities, perhaps in the form of consolidation of facilities, and new problems, most likely in the form of environmental quality.

CONSUMPTION

Regardless of the rate of production of oil and gas resources in this County or around the world, increasing attention has been paid to the need for reducing consumption of these resources. The major reasons for this perceived need are familiar:

1. fossil fuel resources are finite and becoming more difficult to exploit
2. the environmental costs of uncontrolled consumption of fossil fuels are significant and increasing
3. the economic costs of fossil fuels are certain to increase, largely because of factors 1 and 2

Government officials, energy industry spokespersons, university scholars, and the public at large have all recognized the importance of energy conservation. In more recent years, programs and policies have emerged to address the problem. The three utility companies which serve Santa Barbara County (Southern California Gas, Southern California Edison, and Pacific Gas and Electric) frequently provide energy conservation suggestions to their customers. Regulatory agencies such as the California Public Utilities Commission are deeply involved in energy conservation programs in conjunction with the utility companies. The State Energy Commission regularly makes proposals to the legislature designed to reduce the level of energy consumption and/or encourage the use of environmentally benign and renewable resources such as solar energy. The centerpiece of the emerging National Energy Plan is to reduce the nation's dependence on fossil fuel energy sources, particularly foreign sources.

To date, the policies and programs of these agencies rely on a mixture of voluntary and mandatory measures. Voluntary measures, usually in the form of providing information and creating economic incentives, comprise the central thrust of these programs and policies. If and when the voluntary measures fail to reduce consumption, the balance is likely to shift to more stringent mandatory measures, such as building code and appliance standards.

Whatever the mixture of voluntary and mandatory conservation policies, local governments are certain to play a significant role. In contrast to plans for new oil platforms, LNG plants, or power generating plants, energy conservation is one aspect of the "energy question" where local governments can play an active and positive role. The County of Santa Barbara has become familiar with the real constraints imposed upon its authority when presented with large-scale oil and gas development projects. Constraints associated with future plans for a power generation facility in the County will be at least as severe. Energy conservation programs, on the other hand, are particularly well-suited for local governments. Successful energy conservation measures, particularly those of a voluntary nature, require more direct contact with the end-user. As energy consuming entities themselves and as the most visible level of government to the energy consuming public, local governments have a tremendous opportunity and responsibility to become active participants in confronting the energy problem.

Local governments are beginning to respond to these opportunities. The Counties of San Diego, Santa Clara, San Bernardino, and Sacramento have all adopted an "energy element" to their Comprehensive Plans. In each case, energy conservation and the promotion of solar energy are central to their program. The State Energy Commission and the Federal Department of Energy have programs to support local efforts. The National Association of Counties considers energy conservation a top priority for local governments.

The opportunities for energy conservation in California are substantial. The California Public Utilities Commission, for example, recently stated that, if every owner of a gas-heated furnace would simply turn off the pilot light during the summer months, the equivalent of 22-25 billion cubic feet would be saved; this is almost twice as much gas as the entire County consumed in 1977. A 1978 report by the Energy Commission suggests that a combined energy conservation and solar energy conversion program would reduce the need for natural gas in 1985 by 513 mmcfd; this is equivalent to the amount of gas that would be imported at that time from Indonesia for the proposed LNG facility. A 1978 report by an agency of the Department of Energy argues that as much as 86 percent of all of California's energy needs could be provided by the year 2025 with a strong program for energy conservation and conversion to renewable resources. On a nation-wide basis, a Council of Environmental Quality report to the President projects 25 percent of all U.S. energy needs would be satisfied by a similar program by the turn of the century.

Energy conservation, particularly when integrated with a program to convert to alternative energy sources, is being seen as a major, if not <u>the</u> major, new "source" of energy.

Santa Barbara County abounds with energy resources. Some of these resources, primarily oil and gas, have been produced and "exported" for some time. The development of additional oil and gas resources in the Santa Barbara Channel, Alaska, and overseas promise to make the Channel and the onshore coastal areas of the County the location for the transportation and distribution of "imported" resources. Additional local energy resources, primarily solar energy, have yet to be developed on a significant scale. Energy conservation, the judicious development and rational use of all these resources, is an issue badly in need of a program.

RECOMMENDATIONS

1. Expand and improve the information pertaining to current and expected patterns of energy consumption in the County.

DISCUSSION:

Effective planning for energy conservation is dependent upon accurate information regarding the types and quantities of energy consumed in the County. The charts presented here (see page 266) should be seen as an initial effort to identify a comprehensive energy consumption profile.

Of particular value would be a more accurate understanding of the <u>end-use</u> of energy consumption. For example, Chart III suggests that, in the residential sector, the major energy consuming activities are space heating and water heating, and that most of this energy is provided by natural gas. Since natural gas is in short supply in California and since considerable reduction in consumption in Santa Barbara County can be realized by such actions as increased insulation and installation of solar energy equipment, end-use information can be helpful in identifying areas most appropriate for energy conservation programs. Similar information for other sectors - commercial, industrial, agricultural, and governmental - is more difficult to determine, but will prove important in any effort to identify and promote opportunities for energy conservation.

2. Identify the potential for energy conservation measures and for the promotion of policies to convert to non-fossil fuel energy sources.

DISCUSSION:

Within the last decade, substantial knowledge about a wide variety of energy conservation techniques and energy conversion possibilities has become available. Some alternatives, such as hydroelectric or geothermal, are not particularly well-suited for this County, while alternatives such as solar energy, wind, and biomass offer significant potentials.

In the effort to identify the types and scale of these potentials, it is important to match the type of energy to the end-use. For example: solar energy is best suited for low and medium temperature heat requirements such as hot water, space heat, and some industrial heat processes; wind energy is particularly well-suited for operations such as pumping; and biomass can provide gaseous or liquid fuels for transportation.

3. Review and coordinate the implementation of energy conservation-related County policies and ordinances.

DISCUSSION:

Building codes, environmental impact reviews, ordinances governing the use of lighting, and land-use plans are examples of public policies which have a significant influence on levels and types of energy consumed. While the general guidelines for these policies are usually mandated by State and Federal law, local governments often have an opportunity to adopt or enforce variations most suitable for local regions and most consistent with local interests. An effective local government response to these opportunities requires an on-going effort to consciously pursue energy conservation as a priority and to coordinate County agency activities in these areas.

4. Implement an aggressive conservation and alternative energy program for County and public facilities.

DISCUSSION:

Local governments have an opportunity to be in the forefront in demonstrating the effectiveness of conservation and alternative energy applications by adopting these measures for their own facilities. After a thorough investigation of energy consumption patterns in County facilities (as part of recommendation 3), it will be possible to identify and implement specific conservation and conversion measures most appropriate for these facilities. Many measures will certainly be cost-effective in the sense of assured and near-term payoffs. Other measures may require a substantial front-end investment with longer term life-cycle payoffs. An aggressive program would willingly assume the burdens of the front-end costs because of the longer-term benefits and because of the value of these projects for promoting community energy conservation and alternative energy applications.

5. Establish on-going public education energy conservation outreach programs.

DISCUSSION:

The success of federal, state, and local energy conservation measures will ultimately depend upon public acceptance of their value and viability. In some cases, the building industry, developers, realtors, or banks

may feel that certain policies are either unnecessary or impose a hardship on their operations. Citizens may feel conservation or alternative energy requirements are unrealistic. Extensive public hearings prior to implementation can help prevent the adoption of unjustifiable measures. Confusion and possibly resistance on the part of the affected groups or individuals can be reduced by active participation of County representatives in workshops, public hearings, literature distribution, and related public education programs.

6. Actively participate in the energy conservation programs of the local, state, and federal agencies.

DISCUSSION:

Such participation can take two forms: as an advocate and as a recipient of grants. Opportunities for participation in both forms are certain to increase as public and private agencies become aware of the complexities and long-term nature of energy planning.

As an advocate, the County can follow the evolving energy policy-making efforts of neighboring county agencies, state, and federal legislatures, and regulatory commissions, offering support for effective policies and constructive criticism for ill-advised measures. Of particular value would be an active role in the rulings of the Public Utilities Commission and the California Energy Commission. These two agencies are central to the emerging energy policy in California and will be critical to the fate of energy conservation and alternative energy applications.

Simultaneously, the County can actively seek participation in the funding opportunities for energy conservation programs available through state and federal agencies. Because of the high priority attached to the energy issue, and because of the as yet unfulfilled promise of energy conservation, state and federal agencies are increasing the opportunities for assistance to those local governments which demonstrate a commitment to these objectives.

7. Consider energy conservation and conversion to alternative energy sources the central focus of an Energy Element for the Santa Barbara County Comprehensive Plan.

DISCUSSION:

An Energy Element could, and should, embrace a wide variety of issues.

- A comprehensive assessment of conventional energy production operations in the County, existing and proposed.

- A comprehensive assessment of conventional energy consumption in the County.

- A thorough description of the impacts of conventional and nonconventional energy production and consumption patterns.

- A coordination of County efforts in the review and (if necessary) revision of current energy-related County policies, as well as ensuring successful cooperation with appropriate state and federal agencies.

If the potentials of energy conservation are to be realized, energy conservation and the conversion to alternative energy sources must be considered essential to all aspects of an Energy Element.

CHART I

ENERGY PRODUCTION AND CONSUMPTION-- Santa Barbara County, 1977

10^{12} (trillion) BTU

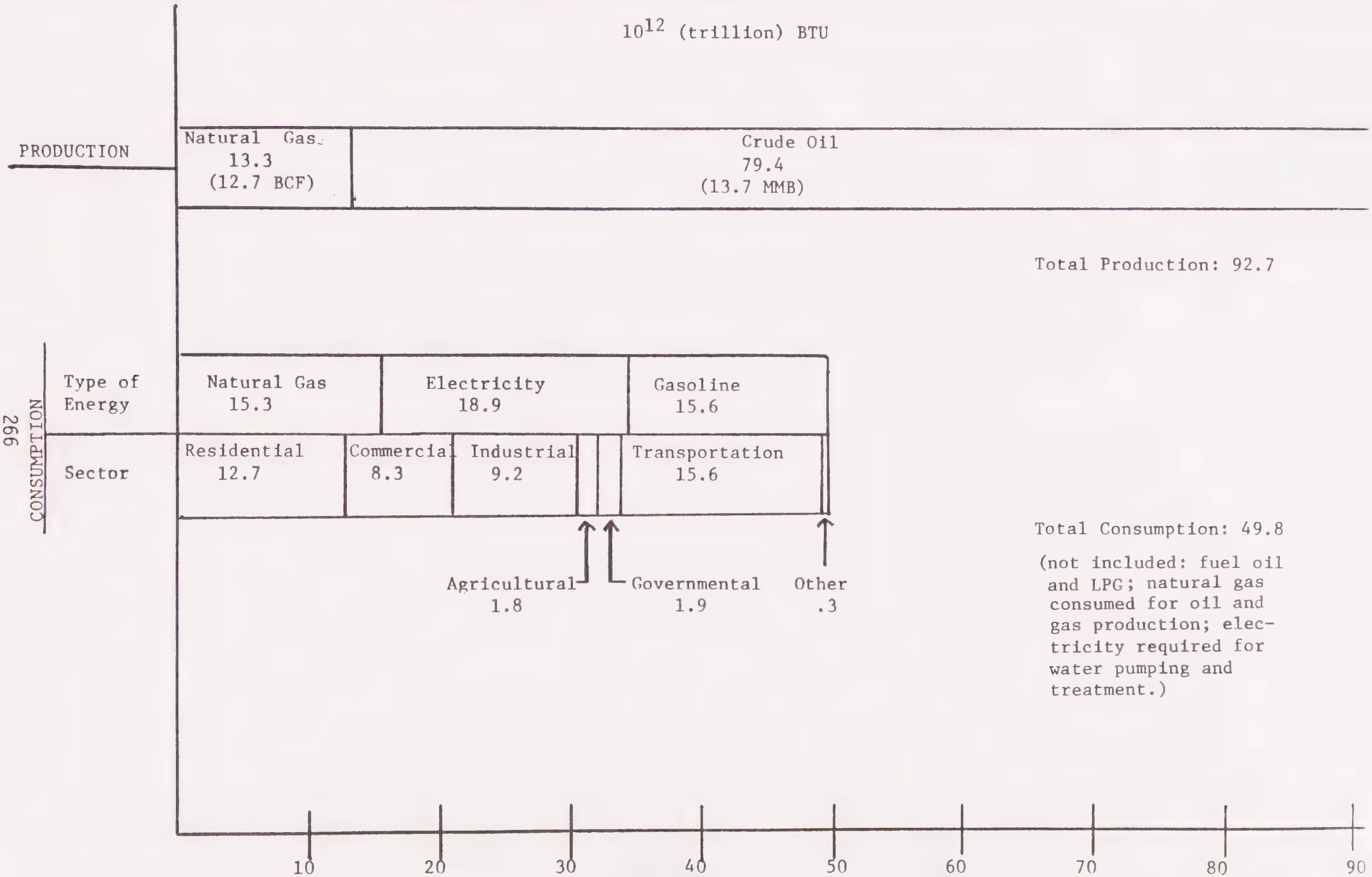
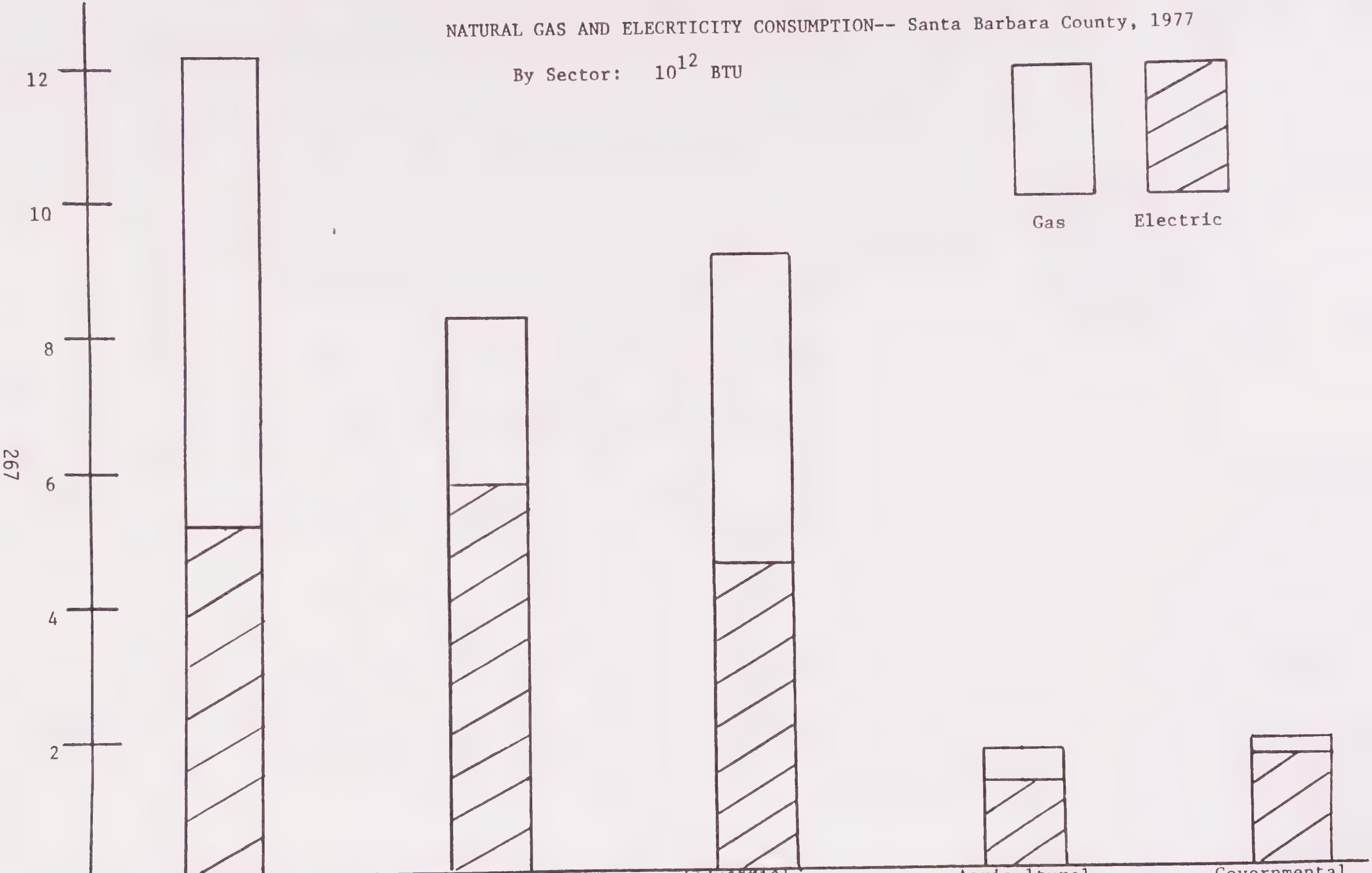


CHART II

NATURAL GAS AND ELECRTICITY CONSUMPTION-- Santa Barbara County, 1977

By Sector: 10^{12} BTU

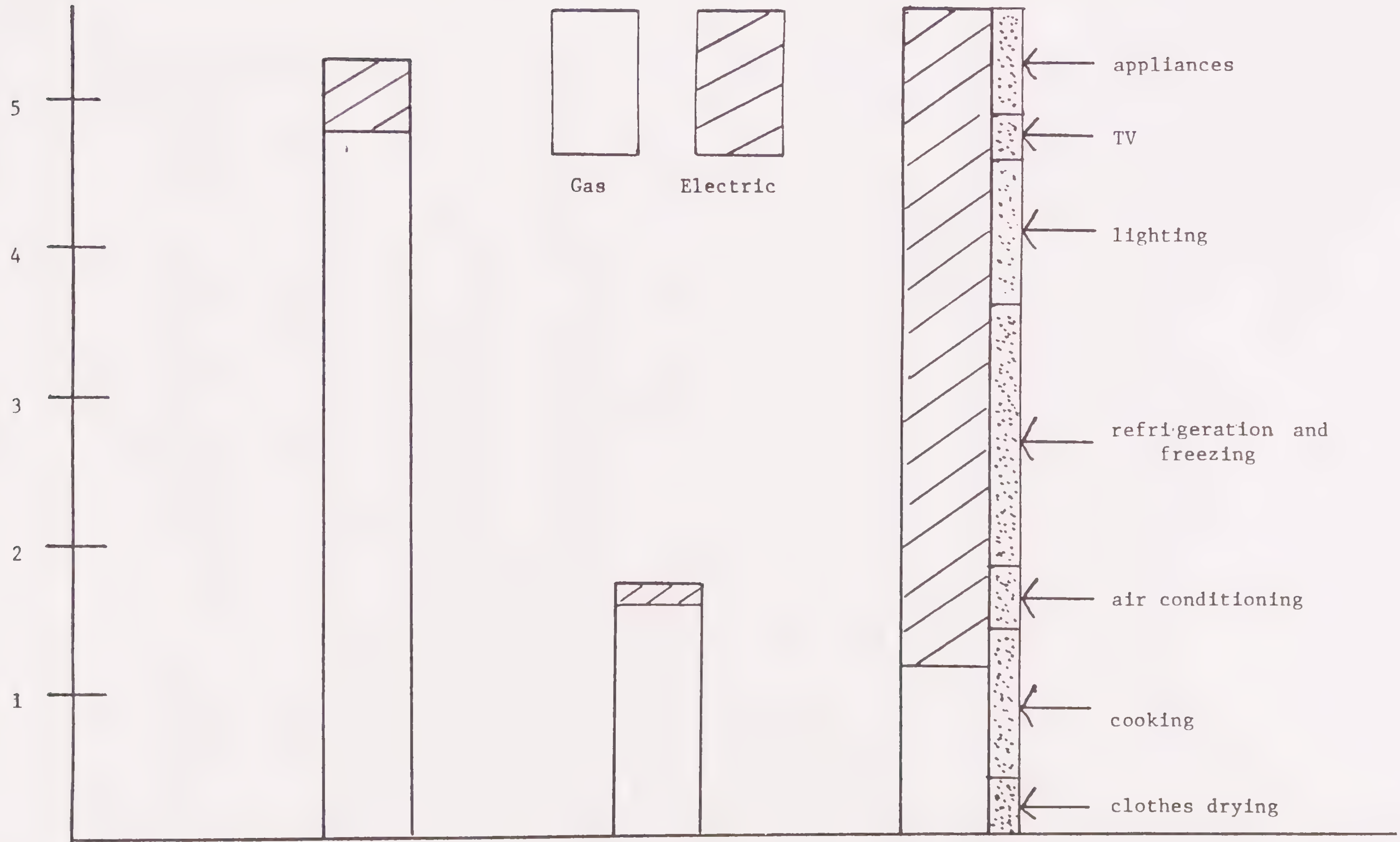


Sector	Residential	Commercial	Industrial	Agricultural	Governmental
gas	7.5	2.5	4.6	.54	.24
elect.	5.2	5.8	4.6	1.26	1.7
Total	12.7	8.3	9.2	1.8	1.94
% of total	37%	24%	27%	5%	6%

CHART III

RESIDENTIAL ENERGY CONSUMPTION-- Santa Barbara County, 1977

By End-Use: 10^{12} BTU



USE	Space Heating	Hot Water	Basic Residential
gas	4.8	1.57	1.13
electricity	.5	.15	4.55
total	5.3	1.72	5.68
%of total sector	42%	14%	44%

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Appendices

APPENDIX A

AGRICULTURAL SUITABILITY COUNTY-WIDE, MODEL STEPS FOR COMPUTER PROGRAMMING

1. Exclude from consideration all cells with coastal beaches or marshes, or an environmental biology tolerance-intensity classification for only regulated scientific study.

2. Assign weights to the sub-classifications of environmental resources.

	Weight
Soils: agricultural capability	
Prime agricultural soils: Class I and II	10
Limited agricultural soils: Class III and IV	7
Primarily rangeland, woodland, and wildlife habitat: Class VI and VII	3
Non-agricultural open space uses: Class VIII	0
Availability of groundwater	
Areas wherein wells produce adequate quantity and quality of water	10
Areas wherein wells have small yield or marginal water quality	5
Areas underlain by groundwater of unsuitable quality or by non-water bearing deposits	0

Sum weights to compute Environmental Resource Index, range 0-20.

3. Assign weights for slope according to the following formula. Flat areas are assumed to be more suitable for irrigated agriculture than areas with steep slopes.

Slope: 0-10 per cent

Divide the number representing the per cent of the cell falling in this category by 10. If no area within the cell is over 10 per cent slope, the weight would be 10 (100÷10).

Slope: 11-20 per cent

Divide the number representing the per cent of the cell falling in this category by 20.

Slope: 21-30 per cent

Divide the number representing the per cent of the cell falling in this category by 40.

Sum weights to compute Landform Index, range 0-10.

Landforms	Landform Index
Flat	9 - 10
Gentle slopes	7 - 9
Rolling hills	4 - 7
Steep slopes, mountains	0 - 4

4. Assign weights to the sub-classifications of environmental constraints. For flood hazard and protection of local water resources, stream channels are not weighted as a binding constraint because they occupy only a portion of a 92 acre cell.

	Weight
Flood hazard *	
Areas without potential flood problems - Categories 5, 8, 9	10
Areas within 100 year flood plain Categories 3, 4	8
Areas with local drainage problems Categories 6, 7, 11	7
Areas within floodway or area of potential flood hazard Categories 2, 10	6

*(See Seismic Safety Element for explanation of rating system.)

APPENDIX A (Cont.)

	Weight
Stream channels	
Category 1	9
<u>Protection of local water resources</u>	
Stream channels	
Category 1	9
Areas tributary to present surface water supplies	
Category 2	6
Areas tributary to future surface water supplies	
Category 3	7
Areas overlying groundwater or tributary to groundwater basins	
Categories 4, 5	9
Other areas	
Category 6	10
<u>Tolerance-intensity classification of environmental biology</u>	
Very high tolerance (7-5)	10
High tolerance (7-4)	9
Moderate-high tolerance (3-5)	7
Moderate-low tolerance (3-4)	3
Low tolerance (3-3)	1
Limited tolerance (3-2)	0
<u>High groundwater</u>*	
High problem rating (31)	0
High-moderate problem rating (33)	2
Other problem ratings (35, 22, 21, 26, 23, 14, 12, 11)	5

*(See <u>Seismic Safety Element</u> for explanation of rating system.)

Sum weights to compute Environmental Constraints Index, range 0-35.

5. Map: <u>Suitability for Agricultural Expansion</u> utilizing the following seven categories.

Highly suitable for irrigated truck and field row crops
Environmental Resource Index = 20
Landform Index = 9 - 10
Environmental Constraints = 28 - 35

Highly suitable for orchard or vineyard
Environmental Resource Index = 17
Landform Index = 1 - 10
Environmental Constraints = 28 - 35

Highly suitable for irrigated crops if surface water is available
Environmental Resource Index = 15
Landform Index = 9 - 10
Environmental Constraints = 28 - 35

Highly suitable for orchard or vineyard if surface water is available
Environmental Resource Index = 12, 7
Landform Index = 1 - 10
Environmental Constraints = 28 - 35

Moderately suitable for crop production
Environmental Resource Index = 12 - 20
Landform Index = 7 - 10
Environmental Constraints = 23 - 35

Suitable only for certain crops
Environmental Resource Index = 7 - 20
Landform Index = 1 - 10
Environmental Constraints = 18 - 35

Unsuitable for crop production
Balance of County

APPENDIX B

SUITABILITY FOR AGRICULTURAL EXPANSION IN STUDY AREAS, MODEL STEPS FOR COMPUTER PROGRAMMING.

1. Exclude from consideration all cells with existing intensive agriculture, urban land use, coastal beaches, marshes, or an environmental biology tolerance-intensity classification for only regulated scientific study. (Non-irrigated cropland is assumed to have potential for more intensive cultivation.)

2. Assign weights to the soil series to represent the suitability for each of the six major crop types, taking slope into account as necessary. (See Table in Agricultural Resources chapter.) These suitability rankings will represent the Soil Suitability Index for each crop type.

3. Assign weights to the sub-classifications for Municipal and Industrial Water Distribution according to the following formula. Areas not easily served by surface water systems could be served by wells; so the results of this model will be checked against the Availability of Groundwater maps.

	Weights
Areas capable of being served	
Category 1	10
Areas requiring minimal extensions	
Category 2	8
Category 4	7
Areas requiring significant reinforcement of distribution system	
Category 3	6
Category 5	5
Areas requiring major extensions and reinforcement of distribution system	
Category 7	3
Category 6	2

4. Assign weights to the sub-classifications of environmental constraints. In the study areas, stream channels are weighted

APPENDIX B (Cont.)

as binding constraints because a significant portion of a 5.74 acre grid cell might be required for their protection.

	Weight
Flood hazard	
Areas without potential flood problems Categories 5, 8, 9	10
Areas within 100 year flood plain Categories 3, 4	8
Areas with local drainage problems Categories 6, 7, 11	7
Areas within floodway or area of potential flood hazard Categories 2, 10	6
Stream channels Category 1	1
Protection of local water resources	
Other areas Category 6	10
Areas overlying groundwater or tributary to groundwater basins Categories 4 and 5	9
Areas tributary to future surface water supplies Category 3	7
Areas tributary to present surface water supplies Category 2	6
Stream channels Category 1	1

APPENDIX B (Cont.)

	Weight
<u>Tolerance-intensity classification of environmental biology</u>	
Very high tolerance (7-5)	10
High tolerance (7-4)	9
Moderate-high tolerance (3-5)	9
Moderate-low tolerance (3-4)	3
Low tolerance (3-3)	1
Limited tolerance (3-2)	0
<u>High groundwater</u>	
High problem rating (31)	0
High-moderate problem rating (33)	2
Other problem ratings (35, 22, 21, 26, 23, 14, 12, 11)	5

(See <u>Seismic Safety Element</u> for explanation of rating system.)

Sum weights to compute Environmental Constraints Index, range 0-35.

6. For each crop type, map <u>Agricultural Suitability for (insert crop type)</u> utilizing the following categories.

Highly suitable for (insert crop type)
- Soils Suitability = 3
- Environmental Constraints = 30 - 35
- Municipal and Industrial Water Distribution = 6 - 10

Highly suitable for (insert crop type) if adequate groundwater available
- Soils Suitability = 3
- Environmental Constraints = 30 - 35

Moderately suitable for (insert crop type)
- Soil Suitability = 2 - 3
- Environmental Constraints = 25 - 35
- Municipal and Industrial Water Distribution = 6 - 10

Moderately suitable for (insert crop type) if adequate groundwater available
- Soil Suitability = 2 - 3

Environmental Constraints = 25 - 35

Low suitability for (insert crop type)
Soil Suitability = 1 - 3
Environmental Constraints = 25 - 35
Municipal and Industrial Water Distribution = 6 - 10

Low suitability for (insert crop type) if adequate groundwater available
Soil Suitability = 1 - 3
Environmental Constraints = 25 - 35

Suitable with environmental problems
Soil Suitability = 1 - 3
Environmental Constraints = 5 - 35

Unsuitable
Balance of study area

7. Combine the individual suitability rankings into a composite map of Suitability for Agricultural Expansion, utilizing the following six categories. Lands that are in the "suitable with environmental problems" category for all crops are shown as unsuitable because of environmental constraints.

Highly suitable for irrigated crops, orchard, vineyard or ornamentals, or for irrigated crops only

Highly suitable for ornamentals only

Moderately suitable for irrigated crops, orchard, vineyard or ornamentals

Low suitability for irrigated crops, orchard, vineyard or ornamentals, or highly suitable for non-irrigated crops

Unsuitable for crop production because of soil capability or environmental constraints

APPENDIX C

Payment Capacities for Various Crops per Hydrologic Basin

TABLE 1

CARPINTERIA BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Avocado	3.8	764.00	2,933.76	1,983.20	950.56	1.6	72.00	639.10
Lemons	12.4	175.35	2,174.34	2,276.34	-102.00	1.5	67.50	- 23.00

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Avocado	3.63	32.23	15.9
Lemons	2.97	- 1.01	13.3

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 2

GOLETA BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Avocado	3.8	764.00	2,933.76	2,023.20	910.56	1.6	112.00	639.10
Lemon	12.4	175.35	2,174.34	2,313.84	-139.50	1.5	105.00	- 23.00
Walnuts	.6	484.00	290.40	406.45	-116.05	1.5	105.00	-7.36

Crop	Present Water Cost % of Prod.Cost	Present Pay Capacity % of Prod.Cost	$225/AF Water Cost % of Prod.Cost
Avocado	5.54	31.59	15.9
Lemon	4.54	- 1.1	13.3
Walnut	25.83	-1.8	52.9

a/ Includes cost of water.

Source: Joyner, D. Demand Analysis for Irrigation Water. University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 3

SANTA YNEZ BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production Cost Per Acre [a/]	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Beans	1.0	489.98	489.98	451.58	38.40	1.5	22.50	40.60
Sugar Beet	24.3	25.73	623.95	530.69	93.26	3.0	45.00	46.09
Corn	30.8	14.00	431.76	312.98	118.78	2.5	37.50	62.51
Carrot	20.9	72.87	1,525.90	1,526.50	-.68	2.5	37.50	14.76
Lettuce	16.0	125.63	2,010.08	1,987.98	22.10	2.8	41.25	23.04
Tomatoes	26.3	45.18	1,190.04	1,022.50	167.54	2.0	30.00	98.77
Alfalfa	8.0	55.00	441.65	453.36	-11.71	4.0	60.00	12.07
Walnuts	.7	484.00	338.80	350.95	-12.15	3.3	49.50	11.32
Vineyard	3.5	398.00	1,393.00	1,251.00	142.00	2.0	30.00	86.00

Cost	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Beans	4.98	8.99	44.1
Sugar Beet	8.48	8.68	58.1
Corn	11.98	19.97	67.1
Carrot	2.46	.97	27.4
Lettuce	2.07	1.16	24.4
Tomatoes	2.93	9.66	31.2
Alfalfa	13.23	2.66	69.6
Walnut	14.10	3.23	71.2
Vineyard	2.40	6.87	26.9

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 4

LOMPOC BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Beans	1.0	489.98	489.98	444.18	45.80	1.5	15.00	40.53
Sugar Beet	24.3	25.73	623.95	514.69	109.26	3.0	30.00	46.42
Corn	30.8	14.00	431.76	300.48	131.28	2.5	25.00	62.51
Broccoli	3.9	246.85	962.71	924.85	37.86	2.5	25.00	25.15
Cabbage	19.7	79.58	1,569.32	1,456.28	113.04	2.5	25.00	55.22
Carrots	20.9	72.87	1,525.90	1,511.00	14.90	2.2	22.00	16.77
Cauliflower	5.6	286.48	1,595.69	1,432.76	162.93	3.0	30.00	64.31
Celery	28.0	122.69	3,437.77	3,308.29	129.48	3.8	38.00	44.07
Lettuce	16.0	125.63	2,010.08	1,972.73	37.35	2.6	26.00	24.37
Alfalfa	8.0	55.00	441.65	428.36	13.29	3.5	35.00	13.80
Walnuts	.7	484.00	338.80	309.45	29.35	1.8	18.00	26.30
Vineyard	3.5	398.00	1,393.00	1,233.00	160.00	1.2	12.00	143.33
Comm.Flrs.	4,800.0*	.67	3,216.00	2,212.00	1,004.00	1.8	18.00	567.78

* Flowers per acre

[a/] Includes cost of water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 4 (cont'd)

LOMPOC BASIN

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Beans	3.38	9.13	44.1
Sugar Beets	5.83	9.02	58.2
Corn	8.32	20.80	67.2
Broccoli	2.70	2.72	38.5
Cabbage	1.72	3.79	78.2
Carrots	1.46	1.11	24.9
Cauliflower	2.09	4.49	32.5
Celery	1.15	1.33	20.7
Lettuce	1.32	1.24	22.9
Alfalfa	8.17	3.22	66.7
Walnuts	5.82	8.49	70.0
Vineyard	.97	11.62	18.1
Comm. Flrs.	.81	25.67	11.0

TABLE 5

SAN ANTONIO BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Beans	1.0	489.98	489.98	444.78	45.20	1.3	15.60	46.77
Sugar Beet	24.3	25.73	623.95	527.69	96.26	3.5	42.00	39.50
Corn	30.8	14.00	431.76	305.48	126.28	2.5	30.00	62.51
Carrot	20.9	72.87	1,525.90	1,515.40	10.50	2.2	26.40	16.77
Tomatoes	26.4	45.18	1,190.49	1,022.50	167.99	2.5	30.00	79.20
Alfalfa	8.0	55.00	441.65	447.36	-5.71	4.5	54.00	10.73
Vineyard	3.5	398.00	1,393.00	1,245.00	148.00	2.0	24.00	86.00

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Beans	3.51	10.52	40.6
Sugar Beet	7.96	7.49	61.9
Corn	9.82	20.46	67.2
Carrot	1.74	1.11	24.9
Tomatoes	2.94	7.75	36.2
Alfalfa	12.07	2.40	72.0
Vineyard	1.93	6.91	27.0

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 6

SANTA MARIA BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Beans	1.0	489.98	489.98	444.18	45.80	1.5	15.00	40.53
Sugar Beet	24.3	25.73	623.95	514.69	109.26	3.0	30.00	46.42
Corn	30.8	14.00	431.76	300.48	131.28	2.5	25.00	62.51
Broccoli	3.9	246.85	962.71	924.85	37.86	2.5	25.00	25.15
Cabbage	19.7	79.58	1,569.32	1,456.28	113.04	2.5	25.00	55.22
Carrots	20.9	72.87	1,525.90	1,511.00	14.90	2.2	22.00	16.77
Cauliflower	5.6	286.48	1,595.69	1,432.76	162.93	3.0	30.00	64.31
Celery	28.0	122.69	3,437.77	3,308.29	129.48	3.8	38.00	44.07
Lettuce	16.0	125.63	2,010.08	1,972.73	37.35	2.6	26.00	24.37
Strawberry	21.6	484.27	10,460.23	9,180.00	1,280.23	4.0	40.00	330.06
Tomatoes	26.3	45.18	1,190.04	1,012.50	177.54	2.0	20.00	98.77
Potatoes	17.1	85.00	1,450.95	1,343.54	107.41	2.5	25.00	52.96
Chili Pepper	1.7	700.00	1,190.00	1,158.20	31.80	4.0	40.00	17.95
Alfalfa	8.0	55.00	441.65	428.36	13.29	3.5	35.00	13.80
Vineyard	3.5	398.00	1,393.00	1,233.00	160.00	1.2	12.00	143.33

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 6 (Cont'd)

SANTA MARIA BASIN

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Beans	3.38	9.13	44.1
Sugar Beet	5.83	9.02	58.2
Corn	8.32	20.80	61.2
Broccoli	2.70	2.72	38.5
Cabbage	1.72	3.79	28.2
Carrot	1.46	1.11	24.9
Cauliflower	2.09	4.49	32.5
Celery	1.15	1.33	20.7
Lettuce	1.32	1.24	23.1
Strawberry	.44	3.60	9.0
Tomatoes	1.98	9.76	31.2
Potatoes	1.86	3.95	30.0
Chili Pepper	3.45	1.55	44.6
Alfalfa	8.17	3.22	66.7
Vineyard	.97	11.62	18.1

TABLE 7

SISQUOC BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a/] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Beans	1.0	489.98	489.98	442.18	47.80	1.3	13.00	46.77
Sugar Beet	24.3	25.73	623.95	519.69	104.26	3.5	35.00	39.79
Corn	30.8	14.00	431.76	300.48	121.28	2.5	25.00	62.51
Broccoli	3.9	246.85	962.71	909.85	52.86	1.0	10.00	62.86
Carrot	20.9	72.87	1,525.90	1,519.00	6.90	3.0	30.00	12.30
Potatoes	17.1	85.00	1,450.95	1,348.54	102.41	3.0	30.00	44.14
Alfalfa	8.0	55.00	441.65	438.36	3.29	4.5	45.00	10.73
Vineyard	3.5	398.00	1,393.00	1,241.00	152.00	2.0	20.00	86.00

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Beans	2.94	10.58	40.6
Sugar Beet	6.73	7.66	61.9
Corn	8.32	20.80	67.2
Broccoli	1.10	6.91	20.0
Carrot	1.97	.81	31.2
Potatoes	2.22	3.27	33.9
Alfalfa	10.27	2.45	72.0
Vineyard	1.61	6.93	26.9

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

TABLE 8

CUYAMA BASIN

Crop	Yield Ton/Acre	Farm Price Avg/Unit	Gross Crop Value Per Acre	Production[a] Cost Per Acre	Net Value Per Acre	Applied Water AF/AC	Applied Water Cost/AC	Payment Capacity Per AF Applied Water
Corn	30.8	14.00	431.76	303.48	128.28	3.2	28.00	48.84
Alfalfa	8.0	55.00	441.65	438.36	3.29	5.0	45.00	9.66

Crop	Present Water Cost % of Prod. Cost	Present Pay Capacity % of Prod. Cost	$225/AF Water Cost % of Prod. Cost
Corn	9.23	16.09	72.3
Alfalfa	10.27	2.20	74.1

a/ Includes cost of Water.

Source: Joyner, D. Demand Analysis for Irrigation Water, University of California Cooperative Extension, Santa Barbara County, March 1976.

APPENDIX D

PERSONS CONSULTED BY THE ENVIRONMENTAL BIOLOGISTS

Waldo Abbott, Senior Curator of Vertebrates at the Santa Barbara Museum of Natural History.

Paul Barker, Assistant Supervisor, U.S. Forest Service, Goleta.

Dr. Selina Bendix, Environmental Review Officer, Department of City Planning, San Francisco.

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Richard Bray, Fisheries Biologist, University of California, Santa Barbara.

Larry Carver, Map Room, University of California, Santa Barbara.

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Karen Kellogg, Member of Isla Vista Planning.

Martin Kellogg, Member of Isla Vista Planning.

Lyndal Laughrin, Island Specialist, Marine Science Institute, University of California, Santa Barbara.

Milton Love, Fisheries Biologist, University of California, Santa Barbara.

Gene Martin, Game Warden, California Department of Fish and Game, Santa Barbara.

Dr. Robert Norris, Professor of Geology, University of California, Santa Barbara.

Dr. Michael Neushul, Professor of Biology, University of California, Santa Barbara.

Craig Rudolph, Vertebrate Biologist and Environmental Consultant, Santa Barbara.

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